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MATERIALS ARE DESCRIBED FOR 42 TRADE PREPARATORY TRAINING COURSES, SEVEN APPRENTICE TRAINING COURSES, TWO TRADE EXTENSION TRAINING COURSES, AND 13 SUPERVISORY PERSONNEL DEVELOPMENT COURSES. INFORMATION FOR EACH INCLUDES A LISTING OF THE MATERIALS (STUDY ASSIGNMENTS, JOB SHEETS, TEST BOOKS, ANSWER BOOKS, INSTRUCTOR'S AIDS), REQUIRED REFERENCES, AND A DETAILED OUTLINE OF THE COURSE. (EL)

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# STATE VOCATIONAL-TECHNICAL & TRADE SCHOOLS
# of
# LOUISIANA

# CATALOG

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STATE OF LOUISIANA
**Vocational Curriculum Development and Research Center**
NATCHITOCHES, LOUISIANA 71457

*for the*

**State Vocational-Technical and Trade Schools**
**of Louisiana**

# CATALOG

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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# Foreword

The Vocational Curriculum Development and Research Center annually publishes a catalog of materials which are available to the state vocational-technical and trade schools of Louisiana.

This catalog is divided into four sections, Trade Preparatory Training Courses, Apprentice Training Courses, Trade Extension Training Courses and Supervisory Personnel Development Courses. Each course is described as to its format, how it is to be ordered, what instructors aids are available, the required bibliography, and a detailed outline of the material.

The catalog is punched for a three ring binder. It is recommended that it be placed in a binder so that new material can be readily added or revised material be replaced conveniently.

We hope this material will be of use to the various schools.

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7. Industrial Relations
8. Interviewing for Supervisory Personnel
9. Introduction to Management
10. Listening
11. Report Writing
12. Understanding Human Nature
13. Work Simplification

The Auto Mechanics Course (Trade Preparatory) was published in 1948-49 and was revised in 1955, 1958 and again in 1963. This course is available in loose form with the Related Study Assignment, Job and Math stapled together and in book form.

| | |
|---|---|
| Book I | |
| Related Study Assignments | Units I - V |
| Jobs | Units I - V |
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| Book II | Units VI - X |
| Book III | Units XI - XV |
| Book IV | Units XVI - XX |

Answer Book
    Complete for Units I - XX

The following Instructor's Aids are available:
- Progress Chart
- Individual folder type

The references for the Auto Mechanics (Trade Preparatory) Course are the following:

| Title | Source |
|---|---|
| GENERAL REPAIR TOOLS FOR AUTOMOBILE MECHANICS | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Glenn, Harold T.<br>AUTOMECHANICS | Charles A. Bennett Co., Inc.<br>237 N. Monroe Street<br>Peoria, Illinois |
| Crouse, William H.<br>AUTOMOTIVE MECHANICS<br>3rd and 4th Editions | McGraw-Hill Book Co.<br>330 West 42nd Street<br>New York 36, New York |

References (Continued)

| Title | Source |
|---|---|
| MOTOR SERVICE'S<br>AUTOMOTIVE ENCYCLOPEDIA | Goodheart-Willcox Co.<br>1322 South Wabash Ave.<br>Chicago 5, Illinois |
| BARRETT BRAKE SERVICE,<br>BOOK I | Barrett Brake Equipment<br>21st and Cass<br>St. Louis, Missouri |
| Stockel, Martin W.<br>AUTO MECHANICS<br>FUNDAMENTALS | Goodheart-Willcox Co.<br>18250 Harwood Ave.<br>Homewood, Illinois |
| Stieri<br>BASIC WELDING PRINCIPLES | Prentice-Hall<br>Englewood Cliffs<br>New Jersey |

A detailed outline of the Auto Mechanics Course (Trade Preparatory) follows:

Unit I - Benchwork

| | | |
|---|---|---|
| Math | 1 | Addition of Whole Numbers |
| Math | 1A | Subtraction of Whole Numbers |
| Math | 1B | Linear Measurement |
| R.S.A. | 1 | Hand Tools and How to Use |
| Job | 1 | Identify Assigned Tools |
| Math | 2 | Scale Practice |
| R.S.A. | 2 | Bolts and Nuts Specifications |
| Job | 2 | Identify Bolts and Nuts |
| Math | 3 | Addition of Scale Measurements |
| R.S.A. | 3 | Files and Filing |
| Job | 3 | Make a Drill Gauge |
| Math | 4 | Subtraction of Scale Measurements |
| R.S.A. | 4 | Twist Drills |
| Job | 4 | Sharpen a Twist Drill |
| Math | 5 | Multiplication of Whole Numbers |
| R.S.A. | 5 | Drilling and Tapping |
| Job | 5 | Reading the Micrometer |
| Job | 5A | Make Internal Thread Block |
| Math | 6 | Division of Whole Numbers |
| R.S.A. | 6 | Threading |
| Job | 6 | Make a Stud |
| Math | 7 | Reducing Fractions to Lowest Terms |
| R.S.A. | 7 | Installing Studs and Removing Broken Studs |
| Job | 7 | Remove Broken Stud by Drilling |
| Job | 7A | Remove Broken Stud with Extractor |
| Job | 7B | Repair Damaged Threads by Installing Heli-coil |

## Unit I - Benchwork (Continued)

| | | |
|---|---|---|
| Math | 8 | Changing Improper Fractions to Mixed Numbers |
| R.S.A. | 8 | Solder, Soldering, and Soldering Coppers |
| Job | 8 | Soldering |
| Job | 8A | Make a Bolt and Nut Tray |
| Job | 8B | Wire Splicing and Soldering |
| Math | 9 | Changing Mixed Numbers to Improper Fractions |
| R.S.A. | 9 | Grinding a Screwdriver |
| Job | 9 | Grind a Screwdriver |
| R.S.A. | 10 | Tubing |
| R.S.A. | 10A | Flex Tubing (Hose) |
| Job | 10 | Tubing, Cutting, Flaring, and Bending |

## Unit II - Preventive Maintenance

| | | |
|---|---|---|
| R.S.A. | 1 | Lubricating Oils |
| Job | 1 | Drain Crankcase and Refill |
| R.S.A. | 2 | Engine Lubrication |
| Job | 2 | Remove and Replace Element in Oil Filter |
| R.S.A. | 3 | Air Cleaners |
| Job | 3 | Remove, Clean, Refill, and Replace Air Cleaner |
| R.S.A. | 4 | Lubrication |
| Job | 4 | Lubricate Automobile |

## Unit III - Front and Rear Wheel Service

| | | |
|---|---|---|
| R.S.A. | 1 | Front Wheel Service |
| Job | 1 | Remove, Lubricate, and Adjust Front Wheel Bearing |
| R.S.A. | 2 | Grease Seals and Rear Wheel Bearings |
| Job | 2 | Remove and Install Rear Wheel Bearings and Grease Seal |

## Unit IV - Shock Absorbers and Springs

| | | |
|---|---|---|
| R.S.A. | 1 | Operating Principles of Shock Absorbers and Stabilizer |
| Job | 1 | Remove and Replace a Direct-Acting Type Shock Absorber |
| Job | 1A | Remove and Replace Stabilizer |
| R.S.A. | 2 | Springs and Shackles |
| Job | 2 | Remove and Replace Rear Springs |
| Job | 2A | Remove and Replace Front Coil Spring |
| R.S.A. | 3 | Rear Coil Springs, Torsion Bars, Air Level Suspension |
| Job | 3 | Remove and Replace Rear Coil Spring |
| Job | 3A | Remove and Replace Torsion Bars and Adjust Front Suspension Height |

## Unit V - Steering and Front End Alignment

| | | |
|---|---|---|
| R.S.A. | 1 | Tie Rod Ends and Toe-in |
| Job | 1 | Remove and Replace Tie Rod Ends and Adjust Toe-in |

Unit V - Steering and Front End Alignment (Continued)

| | | |
|---|---|---|
| R.S.A. | 2 | Steering Gear Adjustments |
| Job | 2 | Overhaul Gemmer Steering Gear and Adjust |
| Job | 2A | Overhaul and Adjust a Saginaw Steering Gear |
| R.S.A. | 3 | Power Steering |
| Job | 3 | Checking a Power Steering Unit |
| R.S.A. | 4 | Principles of Front End Geometry |
| Job | 4 | Align Front Wheels, Caster, Camber and Toe-in |
| R.S.A. | 5 | Wheel Balancing |
| Job | 5 | Balance Wheel |
| R.S.A. | 6 | Reaming |
| Job | 6 | Rebush Spindle (Pressed in Bushings) |
| R.S.A. | 7 | Front End Alignment on Ball Joint Suspension |
| Job | 7 | Front Wheel Alignment on Ball Joint Suspension |
| Job | 7A | Remove and Replace Front Suspension Ball Joint |
| Job | 7B | Remove and Replace Upper and Lower Control Arms |

Unit VI - Brakes

| | | |
|---|---|---|
| R.S.A. | 1 | Brake Shoes and Lining |
| Job | 1 | Adjust Hand Brakes |
| R.S.A. | 2 | Brake Adjustments |
| Job | 2 | Adjust Brakes (Minor) |
| R.S.A. | 3 | Principles of Hydraulic Brake Systems |
| Job | 3 | Bleed Hydraulic Brake System and Replenish Brake Fluid |
| R.S.A. | 4 | Hydraulic Master Cylinders and Wheel Cylinders |
| Job | 4 | Remove and Recondition Wheel Cylinders |
| Job | 4A | Remove and Recondition a Master Cylinder |
| Job | 4B | Replace Broken Brake Line |
| R.S.A. | 5 | Brake Drums |
| Job | 5 | Turn Brake Drum |
| Job | 5A | Reline Brakes, and Adjust (Bendix) |
| R.S.A. | 6 | Power Brakes |
| Job | 6 | Remove and Recondition a Power Brake Unit and Replace |
| Job | 6A | Reline Brake and Adjust (Lockheed) |

Unit VII - Universal Joints, Drive Shafts, and Rear Axle

| | | |
|---|---|---|
| R.S.A. | 1 | Universal Joints and Drive Shafts |
| Job | 1 | Remove and Repair a Universal Joint (Cross and Two Yoke Type) |
| Job | 1A | Remove and Repair a Universal Joint (Ball and Trunnion Type) |
| Job | 1B | Remove and Replace Rear Axle |
| R.S.A. | 2 | Principles of the Differential |
| Job | 2 | Disassemble, Assemble and Adjust Rear End |
| Job | 2A | Disassemble and Adjust Rear End (Chrysler Products) |

Unit VII - Universal Joints, Drive Shafts, and Rear Axle (Continued)

| | | |
|---|---|---|
| R.S.A. | 3 | Differential Service |
| Job | 3 | Overhaul Rear End |
| R.S.A. | 4 | Traction Drive |
| Job | 4 | Remove and Overhaul Safe-T Track Rear Axle |

Unit VIII - Clutch and Transmission

| | | |
|---|---|---|
| R.S.A. | 1 | Principles of the Clutch |
| Job | 1 | Adjust Clutch Pedal Free Play |
| R.S.A. | 2 | Clutch Service |
| Job | 2 | Remove and Replace Clutch |
| R.S.A. | 3 | Principles of the Transmission |
| Job | 3 | Adjust Gearshift Linkage |
| R.S.A. | 4 | The Synchromesh Transmission |
| Job | 4 | Disassemble and Assemble Transmission (Ford) |
| Job | 4A | Disassemble and Assemble Transmission (Chevrolet) |
| Job | 4B | Disassemble and Assemble Transmission (Pontiac) |
| R.S.A. | 5 | Transmission Troubles |
| Job | 5 | Remove, Overhaul and Replace Transmission |
| R.S.A. | 6 | Overdrive |
| Job | 6 | Remove, Overhaul and Replace Overdrive |
| R.S.A. | 7 | Roto-Hydra-Matic Transmission |
| Job | 7 | Adjust Control Linkage on a Roto-Hydra-Matic Transmission |
| Job | 7A | Disassemble and Assemble Roto-Hydra-Matic Transmission |
| R.S.A. | 8 | Controlled Coupling or Super Hydra-Matic Transmission |
| Job | 8 | Disassemble and Assemble a Controlled Coupling Transmission |
| R.S.A. | 9 | Powerglide Transmission Service Adjustments |
| Job | 9 | Powerglide Transmission Linkage Adjustment |
| R.S.A. | 10 | The Powerglide Transmission |
| Job | 10 | Disassemble and Repair Powerglide Transmission |
| R.S.A. | 11 | Cruise-O-Matic Band and Throttle Linkage Adjustment |
| Job | 11 | Adjust Throttle Linkage and Bands on Cruise-O-Matic Transmission |
| R.S.A. | 12 | The Cruise-O-Matic Transmission |
| Job | 12 | Disassemble and Repair a Cruise-O-Matic Transmission |
| R.S.A. | 13 | The Torqueflite Transmission |
| Job | 13 | Disassemble and Repair Torqueflite Transmission |
| R.S.A. | 14 | Transmission-Push Button Controls |
| Job | 14 | Push Button Control Cable Adjustment |

Unit IX - Fuel System

| | | |
|---|---|---|
| R.S.A. | 1 | Fuel Gauges and Fuel Pumps |
| Job | 1 | Test Fuel Level Gauge |
| Job | 1A | Replace Gas Lines and Flexible Gasoline Connection |
| Job | 1B | Check Fuel Pump Pressure, Vacuum and Volume |
| Job | 1C | Overhaul Fuel Pump, Install on Engine, and Test |
| R.S.A. | 2 | Principles of Carburetion |
| R.S.A. | 2A | Carburetor Circuits |
| Job | 2 | Remove, Disassemble, Clean and Repair a Carburetor (Carter BBS) |
| R.S.A. | 3 | Carburetor Circuits (Rochester) |
| Job | 3 | Remove, Disassemble, Clean and Repair a Carburetor (Rochester Model BC) |
| Job | 3A | Remove, Disassemble, and Repair a Ford V-8 Carburetor |
| R.S.A. | 4 | Four Barrel Carburetor |
| Job | 4 | Remove, Disassemble and Repair a Four-Barrel Carburetor (Rochester 4GC) |
| R.S.A. | 5 | Choke Control and Manifold Heat Control |
| Job | 5 | Free Up Heat Control Valve |
| R.S.A. | 6 | Fuel Injection |
| Job | 6 | Solder Leak in Fuel Tank |

Unit X - Ignition System

| | | |
|---|---|---|
| R.S.A. | 1 | Basic Principles of Electricity |
| R.S.A. | 1A | Battery Service |
| Job | 1 | Service a Battery |
| R.S.A. | 2 | High Tension Cables and Spark Plugs |
| Job | 2 | Service Spark Plugs, High Tension Wires and Distributor Cap |
| R.S.A. | 3 | Ignition System |
| Job | 3 | Remove and Replace Distributor Points and Set Ignition Timing |
| Job | 3A | Tune Up Checks and Adjustment. (Vacuum, Dwell, Timing, Compression, Coil, Condenser, Spark Plugs, Distributor Resistance, and Ignition Primary Circuit Resistance) |

Unit XI - Generators and Regulators

| | | |
|---|---|---|
| R.S.A. | 1 | Generators |
| R.S.A. | 1A | Generator Service |
| Job | 1 | Remove, Disassemble, Repair and Replace a Generator |
| R.S.A. | 2 | Generator Regulators |
| Job | 2 | Check and Adjust a Voltage Regulator |
| R.S.A. | 3 | Alternators (A.C. Generators) |
| Job | 3 | Testing Alternator Output (A.C. Generator) |

## Unit XII - Starting Motors

| | | |
|---|---|---|
| R.S.A. | 1 | Starting Motor Fundamentals, Cables, Controls and Drives |
| Job | 1 | Install New Starter Cables and Solenoid Switch |
| R.S.A. | 2 | Starter Maintenance and Test |
| Job | 2 | Check Starter Insulated Circuit, Solenoid Resistance, Battery Capacity, and Starter Amperage Draw |
| Job | 2A | Install and Test Field Windings for Open Circuits and Grounds |
| Job | 2B | Remove, Overhaul and Replace Starter |

## Unit XIII - Cooling System

| | | |
|---|---|---|
| R.S.A. | 1 | Functions of the Cooling System |
| Job | 1 | Remove, Inspect, Test and Replace Water Pump, Thermostat, Fan Belt, and Pressure Cap |
| R.S.A. | 2 | Flushing Cooling System |
| Job | 2 | Remove, Solder, Test, And Replace Radiator |
| R.S.A. | 3 | Antifreeze |
| Job | 3 | Install and Test Antifreeze |

## Unit XIV - Engine Overhaul (Benchwork)

| | | |
|---|---|---|
| R.S.A. | 1 | Engine Fundamentals and Components |
| Job | 1 | Clean Engine with Cold (or Hot) Degreasing Solution |
| R.S.A. | 2 | Oil Pumps and Pressure Regulators |
| Job | 2 | Remove, Inspect, and Replace Oil Pump |
| Job | 2A | Clean Oil Pressure Relief Valve |
| Job | 2B | Remove and Replace Expansion Plug |
| R.S.A. | 3 | Valve Operating Mechanisms |
| Job | 3 | Remove, Reface and Replace Rocker Arms |
| R.S.A. | 4 | Servicing Valves |
| Job | 4 | Grind Valve on I-Head Engine |
| R.S.A. | 5 | Valve Timing |
| Job | 5 | Remove and Replace Timing Gear or Chain |
| R.S.A. | 6 | Engine Bearing, Crankshaft and Camshaft |
| R.S.A. | 6A | Piston Pins and Bushings |
| Job | 6 | Remove Old and Fit New Piston Pin and Bushing, and Align Connection Rod |
| R.S.A. | 7 | Piston, Rings and Cylinders |
| R.S.A. | 7A | Cylinder Reconditioning |
| Job | 7 | Rebore Cylinder |
| Job | 7A | Overhaul Engine Completely |

## Unit XV - Engine Repairs

| | | |
|---|---|---|
| Job | 1 | Remove Engine From Car and Replace it |
| Job | 2 | Adjust New Connecting Rod Bearing with Engine in Car (Precision Insert Type) |
| Job | 3 | Adjust Main Bearings with Engine in Car |
| Job | 4 | Grind Valves on I-Head Engine in Car |

### Unit XVI - Lights and Horns

| | | |
|---|---|---|
| R.S.A. | 1 | Lights and Lighting Circuits |
| Job | 1 | Install Headlight Sealed Beam and Focus Headlights |
| Job | 1A | Test for Short, Open and Ground Circuit at Headlight |
| Job | 1B | Install Dimmer Switch |
| Job | 1C | Install Stop Light Switch |
| Job | 1D | Install Headlight Switch |
| Job | 1E | Install New Wiring Harness |
| R.S.A. | 2 | Horns, Switches, and Relays |
| Job | 2 | Install New Horns and Relay |
| Job | 2A | Test for Open and Short in Horn that will not Blow |
| Job | 2B | Install New Horn Wiring Circuit |
| R.S.A. | 3 | Turn Signals and Back-up Lights |
| Job | 3 | Servicing Turn Signals and Back-up Lights |

### Unit XVII - Automobile Accessories

| | | |
|---|---|---|
| R.S.A. | 1 | Accessory Equipment |
| Job | 1 | Install Heater |
| Job | 1A | Remove and Install Speedometer |
| Job | 1B | Remove, Clean, Adjust, and Replace Vacuum Windshield Wiper Motor |
| Job | 1C | Install Mufflers and Tail Pipes and Adjust Brackets |
| R.S.A. | 2 | Electric Wiper Motors |
| Job | 2 | Remove, Clean, Inspect, Replace and Adjust Electric Wiper |
| R.S.A. | 3 | Power Seats |
| Job | 3 | Remove and Replace Power Front Seat Adjuster |
| R.S.A. | 4 | Air Condition Service |
| Job | 4 | Check for Leaks, Repair Leaks and Recharge Air Conditioning System on Chevrolet |
| Job | 4A | Remove and Replace Air Conditioner Dryer-Receiver Tank on Chevrolet |
| Job | 4B | Remove and Replace Air Conditioning Thermostatic Expansion Valve on Chevrolet |
| Job | 4C | Replace Air Conditioner Compressor Seal on Chevrolet |

### Unit XVIII Welding-Oxyacetylene

| | | |
|---|---|---|
| R.S.A. | 1 | Setting Up Equipment |
| Job | 1 | Set Up Oxyacetylene Welding Apparatus |
| R.S.A. | 2 | Welding Steel |
| Job | 2 | Run Beads, Flat Position 1/8" Material |
| Job | 2A | Flat Position Butt Weld 1/8" Material |
| R.S.A. | 3 | Flame Cutting |
| Job | 3 | Hand Cut 1/2" Material |

Unit XVIII - Welding-Oxyacetylene (Continued)

| | | |
|---|---|---|
| R.S.A. | 4 | Bronze Welding |
| Job | 4 | Flat Position Butt Welding 1/8" Material |
| Job | 4A | Bronze Weld Cast Iron Plate |

Unit XIX - Arc Welding

| | | |
|---|---|---|
| R.S.A. | 1 | Equipment and Striking an Arc |
| Job | 1 | Set Up Welding Machine and Strike Arc |
| Job | 1A | Run Continuous Stringer Beads, Flat Position 1/4" Material |
| Job | 1B | Lap Joint Weld Flat Position 1/4" Material |

Unit XX - Shop Practices

| | | |
|---|---|---|
| R.S.A. | 1 | Frame and Body |
| Job | 1 | Remove and Replace Door Lock; Adjust |
| Job | 1B | Adjust Striker Plate |
| Job | 1C | Align Doors |

The Cabinetmaking Course was published in 1952. It is available in the following forms:
For students the material is stapled in individual packages. Related Study Assignments, Jobs, Job Information Sheets, Auxiliary Jobs, Tests and Math are included in Book 1 - Unit 1.

Related Study Assignments, Jobs, and Job Information Sheets are included in Book 2 - Units 2, 3, 4.

Answer Book
Complete for tests and math

The following instructor's aids are available:
Individual Folder Type

There are no references since all needed information is given in the Job Information Sheets.

A detailed outline of the Cabinetmaking Course follows:

Unit I - Furniture

| | | |
|---|---|---|
| Job | 1 | End Table Legs |
| J.I.S. | 1 | The Crosscut Saw |
| R.S.A. | 1 | Wood Screws |
| Math. | 1 | How to Use the Rule |
| Test | 1 | |
| Job | 2 | Stretchers for End Table |
| J.I.S. | 2 | Hand Rip Saw |
| R.S.A. | 2 | Wood Glue |
| Math. | 2 | Calculating Board Feet and Cost |
| Test | 2 | |
| Job | 3 | End Table Top and Assembly |
| J.I.S. | 3 | Dividers and Their Use |
| R.S.A. | 3 | Clamps and Clamping |
| Math. | 3 | Calculating Sheet Products and Their Cost |
| Test | 3 | |
| Job | 4 | Chair |
| J.I.S. | 4 | The Jointer and Its Use |
| R.S.A. | 4 | Nails |
| Math. | 4 | Laying Out a $45^\circ$ Angle |
| Test | 4 | |
| Job | 5 | Night Table |
| J.I.S. | 5 | Preparation of Uniform Stock, Etc. |
| R.S.A. | 5 | Making a Template (The Cabriole Leg) |
| Math. | 5 | Addition of Fractions |
| Test | 5 | |

Course Outline (Continued)

Unit I - Furniture (Continued)

| | | |
|---|---|---|
| Job | 6 | Step Table |
| J.I.S. | 6 | Drawer Construction (Flush Type) |
| R.S.A. | 6 | Making a Bill of Material |
| Math. | 6 | Subtraction of Fractions |
| Test | 6 | |

| | | |
|---|---|---|
| Job | 7 | Bookcase |
| J.I.S. | 7 | Radial Saw |
| R.S.A. | 7 | Coated Abrasives |
| Math. | 7 | Division of Fractions |
| Test | 7 | |

| | | |
|---|---|---|
| Job | 8 | Cocktail Table |
| J.I.S. | 8 | Basic Furniture Units of Construction |
| R.S.A. | 8 | Cabinetmaking Hardware - Hinges |
| Math. | 8 | The Decimal System |
| Test | 8 | |

| | | |
|---|---|---|
| Job | 9 | Pembroke Table |
| J.I.S. | 9 | Making Rule Joint |
| R.S.A. | 9 | Wood Seasoning |
| Math | 9 | Simple Percentage |
| Test | 9 | |

| | | |
|---|---|---|
| Job | 10 | Chest of Drawers |
| J.I.S. | 10 | Drawer Guides |
| R.S.A. | 10 | Plywood |
| Math. | 10 | Personal Checks and Drafts |
| Test | 10 | |

| | | |
|---|---|---|
| Job | 11 | China Cabinet |
| J.I.S. | 11 | Lathe and Lathe Operations |
| R.S.A. | 11 | Grading of Lumber |
| Math. | 11 | Interest and Taxes |
| Test | 11 | |

| | | |
|---|---|---|
| Job | 12 | Desk |
| J.I.S. | 12 | Woodworking Joints |
| R.S.A. | 12 | Lumbering |
| Personal and Social Problems | | |
| Test | 12 | |

| | | |
|---|---|---|
| Job | 13 | Special Project (Selected by the Student) |
| R.S.A. | 13 | Bearings and Power Transmission |
| R.S.A. | 14 | Evolution of Furniture |
| R.S.A. | 15 | Louisiana Woods Suitable for Cabinetmaking |
| Test | 13 | |

Course Outline (Continued)

Unit I - Furniture (Continued)

Auxiliary Job 14: Sharpening Handsaws

Auxiliary Job 15: Attaching Sanding Disc

Auxiliary Job 16: Care of Electric Motors

Auxiliary Job 17: Sharpening Bevel Edge Tools

Auxiliary Job 18: Sharpen Circular Saws

Auxiliary Job 19: Replacing Jointer Knives

Auxiliary Job 20: Changing Circular Saw Blade

Auxiliary Job 21: Pulley Ratios and Machine Speeds

Auxiliary Job 22: Sharpening Auger Bits

Auxiliary Job 23: Dressing Abrasive Wheels

Auxiliary Job 24: Replacing Band and Small Saw Blade

Unit II - Wood Finishing

R.S.A. 16: Preparation of Surface

R.S.A. 17: Varnish Brushes

R.S.A. 18: Spraying Equipment

R.S.A. 19: Finishing Abrasives

R.S.A. 20: Stains

J.I.S. 1: Applying Oil Stains

J.I.S. 2: Applying Water Stain

R.S.A. 21: Crack Fillers

R.S.A. 22: Wood Fillers

J.I.S. 3: Applying Filler

Course Outline (Continued)

## Unit II - Wood Finishing (Continued)

R.S.A. 23: Sealers

R.S.A. 24: Shellac

J.I.S. 4: Applying Shellac

R.S.A. 25: Turpentine

R.S.A. 26: Varnish

J.I.S. 6: Applying Lacquer Sealers

J.I.S. 7: Applying Lacquer

R.S.A. 28: Linseed and Tung Oils

J.I.S. 8: Oil Finish

J.I.S. 9: A New Finish

J.I.S. 10: Bleaching Wood

R.S.A. 29: Enamels

R.S.A. 30: Characteristics of Wood Affecting Finish

R.S.A. 31: Pigments

## Unit III - Custom Work

Job 1: Kitchen Cabinet Base
R.S.A. 32: Hardware, Trim, Its Application and Miscellaneous Items
R.S.A. 33: Covering Materials
Cabinetmaking Drawing, Plates 1-19

Job 2: Kitchen Cabinet Top
R.S.A. 34: New Materials
Cabinetmaking Drawing, Plates 20-44

Job 3: Dining Corner Cabinet
Cabinetmaking Drawing, Plates 45-52

## Unit IV - Production Work

Supplementary Hand Jobs

Unit I - Furniture

Job 1: Lawn Table
J.I.S. 1: Layout and Cut a Cross Lap Joint
Test 1

Job 1-A: Colonial Bench
J.I.S. 1-A: Bench Vise and Stops
R.S.A. 1-A: The Shop
Test 1-A:

Job 1-B: Utility Stand
J.I.S. 1-B: Layout and Cut Duplicate Parts
Test 1-B:

Job 1-C: Lawn Chair
Test 1-C:

Job 2: End Table
J.I.S. 2: Lay Out and Cut Tapers with Jack Plane
Test 2:

Job 3: Cobbler's Bench
J.I.S. 3: To Cut A Rabbet with a Rabbet Plane
Test 3:

The Carpentry Course (Trade Preparatory) was written and published in 1955. The course was revised in 1958 and again in 1963. Instructors may secure the material in book form (4 books; R.S.A.'s, Jobs, Tests, and Answers). Student material is stapled in loose form, that is, each job with the corresponding related material. The material is to be ordered by Unit and Job number. An individual permanent record folder is also available.

The references for the Carpentry (Trade Preparatory) Course are listed below.

| Title | Source |
|---|---|
| HAND WOODWORKING TOOLS | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| F. S. Crispin<br>DICTIONARY OF TECHNICAL TERMS | The Bruce Publishing Co.<br>540 North Milwaukee St.<br>Milwaukee 1, Wisconsin |
| C. Thomas Olivo<br>BASIC MATHEMATICS SIMPLIFIED | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| PRACTICAL PROBLEMS IN MATHEMATICS FOR CARPENTERS | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Ramsey and Sleeper<br>ARCHITECTURAL GRAPHIC STANDARDS | John Wiley and Sons, Inc.<br>440 Park Ave. South<br>New York 16, New York |
| French and Svensen<br>MECHANICAL DRAWING | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| BLUEPRINT READING AND SKETCHING CARPENTRY TRADES RESIDENTIAL | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| CONCRETE FORM CONSTRUCTION | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| FRAMING, SHEATHING AND INSULATION | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |

References (Continued)

| Title | Source |
|---|---|
| Wilson and Werner<br>SIMPLIFIED ROOF FRAMING | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| INTERIOR AND EXTERIOR TRIM | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Wilson and Werner<br>SIMPLIFIED STAIR LAYOUT | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| THE USE OF HAND TOOLS AND PORTABLE MACHINERY | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| PORTABLE POWER TOOLS | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| ARMSTRONG INSTALLATION MANUAL | Armstrong Cork Company<br>Lancaster, Pennsylvania |

A detailed outline of the Carpentry (Day Preparatory) Course follows.

Unit I Hand Tools and Their Uses
- R.S.A. 1 - Measuring Tools, Bench Vise and Stops
- Job 1 - Flower Pot Base, Octagon Top
- R.S.A. 2 - Layout Tools, Testing Tools, and Sawing Tools
- Job 2 - Flower Pot Base, Bottom Cross Pieces (Legs)
- R.S.A. 3 - Bench Planes, Edge Cutting Tools and Mallets
- Job 3 - Make 3 Tapered Table Legs
- R.S.A. 4 - Boring Tools
- Job 4 - Mortise Table Legs
- R.S.A. 5 - Smoothing Tools and Coated Abrasives
- Job 5 - Stretchers For End Table
- R.S.A. 6 - Woodworking Joints and Moldings, Wood Glues, and Clamps and Clamping
- Job 6 - To Make An End Table
- R.S.A. 7 - Miter Box and Fasteners Corrugated
- Job 7 - Picture Frame, Size 8" x 10"

Course Outline (Continued)

Unit I (Continued)
- R.S.A. 8 - The Compass Saw and Coping Saw
- Job 8 - Make Book Ends
- R.S.A. 9 - Hand Router Plane, Dadoes, Plywood, and Grading
- Job 9 - Flower Box
- R.S.A. 10 - Sawhorses, Lumbering, Wood Seasoning, and Grading of Lumber
- Job 10 - Make a Sawhorse
- R.S.A. 11 - To Be Selected By Instructor
- R.S.A. 12 - To Be Selected By Instructor

Unit II Drafting
- R.S.A. 1 - Introductory Drafting Unit of Carpentry
- Job 1 - Basic Lines
- R.S.A. 2 - The Language of Drawing and Learning to Draw
- Job 2 - Law Out Sheet, Horizontal and Vertical Lines
- R.S.A. 3 - Lettering
- Job 3 - Technique of Lettering
- Job 3A - Six Squares, Dividing Into Angles
- R.S.A. 4 - Lines and Dimensions
- Job 4 - Lines and Dimensions
- R.S.A. 5 - Geometrical Construction
- Job 5 - Geometric Problems
- Job 5A - Dial Plate
- R.S.A. 6 - Theory of Shape Description
- Job 6 - Slotted Block, 2-View
- Job 6A - Tenon
- R.S.A. 7 - Reading and Making Drawings
- Job 7 - Offset Spacer, 3-View
- R.S.A. 8 - Hidden Lines
- Job 8 - End Stop
- Job 8A - Inkwell Base
- Job 8B - Tool Post Slide
- Job 8C - V-Guide and Wedge
- R.S.A. 9 - Sections
- Job 9 - Protected Bearing
- Job 9A - Stuffing Box Gland
- Job 9B - Yoke
- Job 9C - Lever Arm
- R.S.A. 10 - Auxiliary Views and Revolutions
- Job 10 - Tapered Wedge
- R.S.A. 11 - Principles of Size Description
- Job 11 - Hollow Molding
- R.S.A. 12 - Technique of the Finished Drawing
- Job 12 - Adjustable Bracket
- Job 12A - Shaft Support

Course Outline (Continued)

Unit II (Continued)
- R.S.A. 13 - Sheet Metal Drafting (Isometric)
- Job 13 - Truncated Square Prism
- Job 13A - Transition Piece
- Job 13B - Truncated Cylinder
- R.S.A. 14 - Pictorial Drawing
- Job 14 - Isometric Figures
- R.S.A. 15 - Production Illustration
- Job 15 - Isometric Offset Block
- Job 15A - Dovetail Figures
- Job 15B - Isometric Cube
- R.S.A. 16 - Screws, Bolts and Other Fastenings
- Job 16 - Machine Bolt
- R.S.A. 17 - Architectural Drawings
- Job 17 - Floor Plan Garage
- R.S.A. 18 - Architectural Drafting
- Job 18 - Foundation and Detail of Roof Construction
- R.S.A. 19 - Architectural Drafting
- Job 19 - Front Elevation
- Job 19A - Side Elevation

Unit III Foundations
- R.S.A. 1 Surveying Instruments
- Job 1 - Set Up and Level the Builder's Transit or Level
- Job 1A - Find the Difference of Level of Two Points
- Job 1B - Run a Straight Line
- R.S.A. 2 - Principles of Laying Out Building Lines
- Job 2 - Locate a Building on a Lot
- R.S.A. 3 - Principles of Erecting and Leveling Batter Boards
- Job 3 - Erect Batter Boards
- R.S.A. 4 - Description, Construction and Erection of Continuous Wall Footing Forms
- Job 4 - Build and Set a Section of Continuous Footing Form
- R.S.A. 5 - Description, Construction and Erection of Pier Footing Forms
- Job 5 - Build a Pier Footing Form
- R.S.A. 6 - Description, Construction and Setting of Concrete Foundation Form Walls and How to Provide for Openings
- Job 6 - Build and Set a Section of Double Wall Form
- R.S.A. 7 - Description of and How to Suspend Anchor Bolts in Concrete Forms
- Job 7 - Suspend Anchor Bolts in Concrete Forms
- R.S.A. 8 - Description, Construction and Setting of Concrete Pier Forms
- Job 8 - Build a Concrete Pier Form

Course Outline (Continued)

Unit III (Continued)

- R.S.A. 9 - Description, Construction and Setting of Concrete Step Forms
- Job 9 - Build and Set a Concrete Step Form
- R.S.A. 10 - Description of and Setting Forms for Concrete Floors and Sidewalks
- Job 10 - Build a Section of Concrete Sidewalk Form
- Job 11 - To Be Selected By Instructor

Unit IV Frame Construction

- R.S.A. 1 - Description of Types of Sill Construction and How to Frame and Install Sills
- Job 1 - Lay Out, Cut and Assemble Solid Sills
- R.S.A. 2 - Description of Floor Joists and How to Install
- Job 2 - Lay Out and Install Floor Joists
- R.S.A. 3 - How to Lay Out, Cut and Install Bridging
- Job 3 - Lay Out, Cut and Install Bridging
- R.S.A. 4 - Description of Methods of Laying Subfloors
- Job 4 - Lay Subfloor Diagonally to Floor Joists
- R.S.A. 5 - How to Lay Out and Cut Plates to Length
- Job 5 - Locate, Lay Out and Cut Plates
- R.S.A. 6 - How to Lay Out and Cut Studs for Side Walls
- Job 6 - Lay Out and Cut Studs for a Single Story Building
- R.S.A. 7 - Corner Posts
- Job 7 - Build a Corner Post
- R.S.A. 8 - How to Frame Walls in a Balloon Frame; Description of and How to Frame Openings in the Outside Walls of a Balloon Frame; and How to Frame Walls in the Platform and Modern Braced Frame
- Job 8 - Assemble Wall Sections
- R.S.A. 9 - Bracing
- Job 9 - Bracing a Wall Section
- R.S.A. 10 - Description of and How to Frame Interior Partitions
- Job 10 - Assemble and Erect an Inside Partition
- R.S.A. 11 - How to Space the Second and Attic Floor Joists
- Job 11 - Install Ceiling Joists
- R.S.A. 12 - Description of Methods of Applying Sheathing
- Job 12 - Apply Outside Wall Sheathing
- R.S.A. 13 - Description and Function of Insulating Materials
- Job 13 - Install Insulating Material
- Job 14 - To Be Selected By the Shop Instructor

Course Outline (Continued)

Unit V Roof Framing, Sheathing and Shingles
- R.S.A. 1 - Terms, Types, and Principles of Roof Framing; Description of Methods of Laying Out a Common Rafter; and Steel Square Common Rafter Table
- R.S.A. 1A - The Framing Square and The Rafter
- Job 1 - Lay Out and Cut a Common Rafter Using the Step-off Method
- R.S.A. 2 - How to Erect a Gable Roof, and Light Wood Framing Details
- Job 2 - Frame a Gable Roof
- R.S.A. 3 - How to Lay Out, Cut and Install Gable Studding
- Job 3 - Lay Out, Cut, and Install Gable Studs
- R.S.A. 4 - Determining the Length of a Collar Tie
- Job 4 - Lay Out, Cut, and Install Collar Ties
- R.S.A. 5 - Description of Methods of Laying Out Hip Rafters and Steel Square Hip Rafter Table
- Job 5 - Lay Out and Cut a Hip Rafter
- R.S.A. 6 - Method of Laying Out Hip Jack Rafters and Steel Square Hip Jack Rafter Table
- Job 6 - Lay Out and Cut a Hip Jack Rafter
- R.S.A. 7 - How to Erect a Hip Roof
- Job 7 - Frame a Hip Roof
- R.S.A. 8 - Description of Methods of Laying Out Valley Rafters; and Steel Square Valley Rafter Table
- Job 8 - Lay Out and Cut a Valley Rafter
- R.S.A. 9 - Method of Laying Out a Valley Jack Rafter; Method of Laying Out a Valley Cripple Jack Rafter; and Steel Square Valley Jack Rafter Table
- Job 9 - Lay Out and Cut a Valley Jack Rafter
- R.S.A. 10 - Method of Laying Out the Hip-Valley Cripple Jack Rafter and Steel Square Hip-Valley Cripple Rafter Table
- Job 10 - Lay Out and Cut a Hip Valley Cripple Jack Rafter
- R.S.A. 11 - How to Erect an Intersecting Gable Roof
- Job 11 - Frame an Intersecting Roof
- R.S.A. 12 - Types of Window Screens
- Job 12 - Apply Roof Sheathing
- R.S.A. 13 - Methods of Applying Roll Roofing
- Job 13 - Apply Roofing Felt
- R.S.A. 14 - Description of Composition Roof Covering and How to Apply Strip Shingles
- Job 14 - Apply Strip Shingles

Course Outline (Continued)

Unit VI Exterior Trim

- R.S.A. 1 - Description and Construction of Window Frames
- Job 1 - Build a Window Frame
- R.S.A. 2 - How to Assemble and Install Window Frames
- Job 2 - Install a Window Frame
- R.S.A. 3 - Description and Types of Aluminum Window Units and Installation Instruction
- Job 3 - Install an Aluminum Window Unit
- R.S.A. 4 - Types of Door Frames
- Job 4 - Build an Exterior Door Frame
- R.S.A. 5 - How to Build and Install Door Frames
- Job 5 - Install an Exterior Door Frame
- R.S.A. 6 - Description of Common Types of Cornices and How to Build
- Job 6 - Apply Box Cornice
- R.S.A. 7 - Description and Application of Corner Boards
- Job 7 - Apply Corner Boards
- R.S.A. 8 - Louvers in Frame Walls
- Job 8 - Build and Install a Louver
- R.S.A. 9 - Description and Application of Exterior Side Wall Covering
- Job 9 - Apply Bevel Siding
- R.S.A. 10 - Stair Types, Terms and Principles and Stair Layout
- Job 10 - Lay Out, Cut and Assemble a Set of Steps
- R.S.A. 11 - The Miter Box and Saw
- Job 11 - Build a Miter Box
- R.S.A. 12 - Types of Window Screens
- Job 12 - Build, Fit and Hang a Window Screen
- R.S.A. 13 - How to Fit Full Surface Hinges and How to Apply Mortise Locks
- Job 13 - Build, Fit and Hang a Screen Door
- Job 14 - To Be Selected by the Shop Instructor

Unit VII Interior Trim

- R.S.A. 1 - Description and Laying Finish Floors and Wood Flooring
- Job 1 - Lay Finish Flooring
- R.S.A. 2 - Methods of Hanging Window Sash, How to Fit Window Sash, and Wood Double Hung and Wood Casement Windows
- Job 2 - Install Window Sash
- R.S.A. 3 - Description and How to Apply Window Trim
- Job 3 - Apply Interior Window Trim
- R.S.A. 4 - Description of Window Hardware
- Job 4 - Apply Window Hardware

Course Outline (Continued)

Unit VII (Continued)
- R.S.A. 5 - Types of Door Frames and How to Install Door Frames
- Job 5 - Build and Install an Interior Door Frame
- R.S.A. 6 - Description of Interior and Exterior Doors; How to Fit a Door; and Stock Wood Doors
- Job 6 - Fit and Hang a Door
- R.S.A. 7 - Description of Finish Hardware and How to Apply Mortise Locks
- Job 7 - Install a Mortise Lock
- R.S.A. 8 - How to Build Stairs with Housed and Open Stringers and Description and How to Fit Newel Posts and Hand Rails
- Job 8 - Lay Out, Cut and Assemble a Stair
- R.S.A. 9 - Types and Installation of Baseboards
- Job 9 - Install Baseboards
- Job 9A - Install Shoe Moulding
- Job 10 - To Be Selected by the Shop Instructor

Unit VIII Portable Power Tools and Their Uses
- R.S.A. 1 - Description, The Circular Handsaw and Portable Saw Blades; Care of Circular Saw Blades; and Methods of Using The Portable Circular Saw
- R.S.A. 1A - Description of Kitchen Cabinets and How to Build and Install a Kitchen Cabinet
- Job 1 - Build and Install Kitchen Base Cabinet
- R.S.A. 2 - Description, The Radial Arm Saw; General Instructions for Operation and Adjustment of the Radial Arm Saw; and Methods of Using the Radial Arm Saw
- R.S.A. 2A - Description of Kitchen Wall Cabinets and How to Build Wall Cabinets
- Job 2 - Build and Install Kitchen Wall Cabinets With a Drop Ceiling
- R.S.A. 3 - Description, The Electric Router; Description of Router Bits and Methods of Inserting Bits in the Collet and Assemble Motor Into Router Base; and Basic Routing Cuts
- R.S.A. 3A - How to Construct Cabinet Drawers and How to Assemble a Cabinet Drawer
- Job 3 - Construct and Assemble Cabinet Drawers
- R.S.A. 4 - Description, The Portable Power Block Plane and Methods of Using the Portable Power Block Plane
- R.S.A. 4A - How to Fit Cabinet Doors
- Job 4 - Fit Cabinet Doors

Course Outline (Continued)

Unit VIII (Continued)

R.S.A. 5 - Description, The Portable Electric Hand Drill; Drills and Bits; and Safety Precautions in Using the Portable Electric Hand Drill
R.S.A. 5A - How to Apply Cabinet Hardware
Job 5 - Apply Cabinet Hardware
R.S.A. 6 - Description, The Portable Sabre Saw and Blades; How to Install Sabre Saw Blades and Base Insert; Methods of Using the Portable Sabre Saw
R.S.A. 6A - Installing Counter Surfaces With Metal Trim and Cove Metal
Job 6 - Fit and Apply Laminated Plastic Counter Top
R.S.A. 7 - The Portable Electric Power Plane; Safe Methods in Using the Portable Electric Power Plane and How to Use the Electric Portable Power Plane
R.S.A. 7A - Description of Mantel Shelves and How to Build Mantel Shelves
Job 7 - Build and Install a Mantel Shelf
R.S.A. 8 - Description, The Portable Belt Sander and General Procedures for Using the Belt Sander
R.S.A. 8A - Selection of Abrasive Belts
R.S.A. 8B - Methods of Building and Installing Built-In-Bookcases
Job 8 - Build a Book Case
R.S.A. 9 - Description, Finishing Sanders; Selection and Installation of Abrasives; and Care and Use of the Finishing Sander
R.S.A. 9A - Description of Corner Cabinets
Job 9 - Corner Cabinets
R.S.A. 10 - Reciprocating Saws and Methods of Operatin the Reciprocating Saw
R.S.A. 10A - How to Build and Install a Medicine Cabinet
Job 10 - Medicine Cabinet
R.S.A. 11 - Description of Linen Closet
Job 11 - Linen Closet
R.S.A. 12 - Description, The Hinge Butt Templet; Description, The Lock Mortiser; Description, The Lock Face Templet
R.S.A. 12A - Description of Clothes Closets
Job 12 - Linen Closet

The Map Drafting and Related Computations section of the Civil Engineering Technology Course was written in 1964 and is available in bound form. The course is composed of 12 sections in one book, and a Field Book. A detailed outline of this course is given below.

Section 1 Introduction

Section 2 Directions of Lines

Section 3 Plotting Angles

Section 4 Plotting Traverses

Section 5 Latitudes and Departures

Section 6 Calculation of Areas

Section 7 Route Surveys with Circular Curves

Section 8 Topographic Maps

Section 9 Profiles and Cross Sections

Section 10 Area Maps

Section 11 Reproduction of Drawings

Section 12 Assignments and Directions for Exercises

Field Survey Notes

This compendium of Electrical Diagrams may be used in any situation requiring the use of such circuits. It is not designed to be limited to any one particular curriculum. It is recommended that it be used as a reference when and where needed. Other uses may develop depending on the requirements of a job and the ability of the student. Additional diagrams will probably be added to future editions of this reference if usage indicates that this is desirable.

A list of diagrams follows:

| | |
|---|---|
| Signal Circuits . . . . . . . . . . . . . . . | 20 Diagrams |
| Lighting Circuits . . . . . . . . . . . . . . | 26 Diagrams |
| Industrial Control Circuits . . . . . . . . . | 26 Diagrams |
| Appliance Circuits . . . . . . . . . . . . . | 5 Diagrams |

The Farm Mechanics Course is available in loose leaf form. The references for the courses will be listed in the separate courses. The instructors will request jobs from the following courses as they see fit:

Carpentry
Electricity
Machine Shop
Plumbing
Small Engine Repair
Tractor Repair and Maintenance
Welding

A detailed outline of the Farm Mechanics Course follows:

CARPENTRY

Unit I - Hand Tools (Required)

Job 1: Use Layout Tools
Job 2: Use Wood Cutting Tools
Job 3: Use Boring and Driving Tools
Job 4: Lay out and Construct a Sawhorse
Job 5: Lay out and Construct a Shoulder Box
Job 6: Lay out a House

R S.A. 1: Measuring and Layout Tools
R.S.A. 2: Wood Boring Tools
R.S.A. 3: Wood Cutting Tools
R.S.A. 4: Wood Cutting Tools (Continued)
R.S.A. 5: Driving Tools
R.S.A. 6: Nails, Screws, and other Fasteners
R.S.A. 7: Lumber

Unit II - Foundations (Required)

Job 1: Build Bulkhead Forms for a Footing
Job 2: Build Bulkhead Forms for a Slab
Job 3: Mix, Pour and Darby a Concrete Slab

R.S.A. 1: Concrete Formwork
R.S.A. 2: Mixing Concrete

Unit III - Framing (Optional)

Job 1: Install Wood Sills
Job 2: Install Floor Joists
Job 3: Install Floor Joist Headers and Bridging
Job 4: Construct a Subfloor
Job 5: Lay out, Assemble and Fasten Lower Plates (Soles)
Job 6: Lay out, Fabricate and Raise Wall Frames
Job 7: Lay out and Construct Ceiling Joists
Job 8: Lay out, Cut and Erect Common Rafters

Course Outline (Continued)

Unit III - Framimg (Optional) (Continued)

Job 9: Lay out, cut and Erect Hip, Valley, Hip Jack, and Valley Jack Rafters
Job 10: Sheathe a Wall

R.S.A. 1: Wood sills, floor joists, bridging and headers
R.S.A. 2: Subfloors
R.S.A. 3: Frame Lay Out (Plates)
R.S.A. 4: Wall Frames
R.S.A. 5: Ceiling Joists and Headers
R.S.A. 6: Common Rafters
R.S.A. 7: Hip Rafters, Hip Jack Rafters
R.S.A. 8: Valley and Valley Jack Rafters
R.S.A. 9: Sheathing

Unit IV - Exterior Trim (Optional)

Job 1: Lay out and Construct a Window Frame
Job 2: Lay out and Construct a Door Frame
Job 3: Set a Window and Door Frame
Job 4: Set a Sash
Job 5: Hang and Lock a Door
Job 6: Hang Finished siding

R.S.A. 1: Window and Door Frames
R.S.A. 2: Setting Frames
R.S.A. 3: Hanging and Locking Doors
R.S.A. 4: Setting Sash
R.S.A. 5: Siding

ELECTRICITY

Unit I - Bell Wiring (Required)

Job 1: Install a door bell or chime

R.S.A. 1: Care and use of hand tools
R.S.A. 2: Principles of electric circuit sketching
R.S.A. 3: Wire connections and soldering

Unit II - Indicating Instruments (Required)

Job 1: Connect a voltmeter, ammeter

R.S.A. 1: Principles of Meters
R.S.A. 2: Care of meters
R.S.A. 3: Reading a watt hour meter

Course Outline (Continued)

Unit III - Wiring to Existing Circuits (Optional)

Job 1: Install one light, one S.P. switch and receptacle using No. 12 nonmetallic sheath cable (Have Students make Sketch)

R.S.A. 1: Introduction to National Electric Code R.S.A. No. 9 Book I Unit I
R.S.A. 2: Polarity identification of systems and circuits R.S.A. No. 4 Book III Unit I
R.S.A. 3: Selection of wire size and current carrying capacity Book I Unit III R.S.A. 7
R.S.A. 4: Circuit sketching
R.S.A. 5: Determine connected load
R.S.A. 6: Types of Fasteners R.S.A. 7 Book I Unit I
R.S.A. 7: Non-metallic cable wiring R.S.A. 8 Book III Unit I

Unit IV - Wiring to New Circuits (Optional)

Job 1: Install one procelain flush chain receptacle, one pendant light with type C lamp cord on lighting circuit and receptacle outlet on an appliance circuit (Have students make sketch)

R.S.A. 1: Types of fuses and circuit breakers and their use. R.S.A. 8 Book I Unit III
R.S.A. 2: Circuit planning
R.S.A. 3: Circuit sketching
R.S.A. 4: Determining illumination
R.S.A. 5: Types of boxes, box covers, and methods of installation R.S.A. 3 Book III Unit I

Unit V - Wiring Between Buildings (Optional)

Job 1: Install one light using two three-way switches from house to barn (Have students make sketch)

R.S.A. 1: Determining number of conductors in conduit or tubing
R.S.A. 2: Grounding
R.S.A. 3: Current carrying capacity of conductors run in free air or in conduit or tubing
R.S.A. 4: Calculation and use of charts in determining tensile strength and voltage drop.
R.S.A. 5: Types of service brackets and wire holders and their use
R.S.A. 6: N.E.C. requirements on outside wiring

Course Outline (Continued)

Unit VI - Wiring (Meter Pole) (Optional)

Job 1: Install a three wire meter service and a two wire feeder between pole and barn and 3 wire feeder between pole and dwellings (Have students make sketch)

R.S.A. 1: Determine service conductor and switch sizes
R.S.A. 2: Locating the meter pole
R.S.A. 3: Branch circuits and service entrance

Unit VII - Motors (Required)

Job 1: Disassemble, clean and reassemble split phase motor

R.S.A. 1: Simple motor
R.S.A. 2: Principle of split phase motor

Unit VIII - Motors (Optional)

Job 1: Mount and connect a split phase dual-voltage reversible motor 110V or 220 V

R.S.A. 1: Calculation of pulley sizes
R.S.A. 2: Determine H.P. of motor to do a job
R.S.A. 3: Principle of capacitor motors
R.S.A. 4: Methods of equipment grounding

Unit IX - Motors (Optional)

Job 1: Disassemble, clean and reassemble repulsion motor and reverse

R.S.A. 1: Principle of repulsion motors
R.S.A. 2: Principle of 3 phase motor
R.S.A. 3: Principle of wound rotor motor

Unit X - Motors (Required)

Job 1: Trouble shooting on motors and motor controllers

R.S.A. 1: Types and operating principles of motor Controller

MACHINE SHOP

Unit I - Lathe

Job 1: Turn a Shaft

Course Outline (Continued)

Unit I - Lathe (Continued)

Job 2: Turn a Threading Blank
Job 3: Threading a Blank
Job 4: Drilling
Job 5: Boring
Job 6: Internal Threads

R.S.A. 1: Principles of the Lathe
R.S.A. 2: Lathe Holding Devices
R.S.A. 3: Cutting Tools
R.S.A. 4: Knurling
R.S.A. 5: Shoulder Turning and Necking
R.S.A. 6: Filing and polishing
R.S.A. 7: Drilling and Reaming
R.S.A. 8: Tapping
R.S.A. 9: Screw Threads Standard
R.S.A. 10: Internal Threading

PLUMBING

Job 1: Setting grade lines for house sewer
Job 2: Thread and connect pipe
Job 3: Cut, bend, and flare copper tubing
Job 4: Cutting and joining cast iron pipe

R.S.A. A: Background of the plumbing trade
R.S.A. 1: Cesspools
R.S.A. 2: Septic tanks
R.S.A. 3: Purification and disposal of discharged effluent, the filter trench and the distribution field
R.S.A. 4: Tools and procedures for cutting and threading pipe
R.S.A. 5: Tools, methods, and fittings for joining copper tubing
R.S.A. 6: Materials used for sewage and vent pipes: Terra cotta; cast iron; galvanized and copper pipe

SMALL ENGINES

Unit I - Basic Repair Skills

R.S.A. 1: Fastening Devices, Calipers, and Thread Gages
Job 1: Identify Bolts and Nuts

R.S.A. 2: Drills, Taps, and Dies
R.S.A. 2A: Tools
Job 2: Make Internal Thread Block and Studs

Course Outline (Continued)

Unit I - Basic Repair Skills (Continued)

R.S.A. 3: Installing Studs and Removing Broken Studs
Job 3: Remove a Broken Stud

R.S.A. 4: Soldering
Job 4: Make a Solder Joint

R.S.A. 5: Hand Tools and How to Use
Job 5: Identify Hand Tools

R.S.A. 6: Tubing
Job 6: Single Flare Copper Tubing

Unit II - Engine Overhaul

R.S.A. 1: Starting, Stopping, and Storing Small Engines
Job 1: Start and Stop Engine (4 Stroke Cycle)

R.S.A. 2: Principles of Operation, Four Stroke Cycles and Two Stroke Cycle

R.S.A. 3: Cooling and Lubrication
Job 2: Clean Air Cooling System (Any Make)

R.S.A. 4: Operation, Repair, Timing, and Adjustment of Valves
Job 3: Reface Valves and Seats (Head and Valve Cover Removed)
Job 4: Remove Old and Install New Valve Seat Insert
Job 5: Counterbore Cylinder for Valve Seat Insert (Valves Removed)

R.S.A. 5: Cylinders
R.S.A. 5A: The Micrometer
Job 6: Hone Cylinder For Oversize Piston, (Aluminum)
Job 7: Hone Cylinder For Oversize Piston, (Cast Iron)

R.S.A. 6: Pistons, Rings and Pins
Job 8: Remove and Replace Connecting Rod, Piston, and Piston Rings (Briggs & Stratton 8 BH)
Job 9: Remove and Replace Connecting Rod, Piston, and Piston Rings, (Briggs and Stratton Model 8)

R.S.A. 7: Connecting rods, Crank and Camshafts, Bearings and Seals
Job 10: Check and Align Connecting Rod
Job 11: Remove and Replace Connecting Rod, Piston, and Piston Rings, (Clinton Model VS 800)
Job 12: Remove Old and Install New Crankshaft Seals and Bearings (Plain Type)

## Course Outline (Continued)

### Unit II - Engine Overhaul (Continued)

Job 13: Overhaul Engine, Briggs & Stratton 8 B-H with Rewind Starter

Job 14: Complete Engine Overhaul, Briggs & Stratton Model 8

Job 15: Complete Engine Overhaul, Clinton Model VS 800

Job 16: Complete Engine Overhaul, Clinton Model AVS 400

Job 17: Complete Engine Overhaul, Lauson Model V17

Job 18: Complete Engine Overhaul, Power Products Type 710112

### Unit III - Starting Mechanisms

R.S.A. 1: Manual Starters
Job 1: Disassemble and Repair, Rewind Starter, Briggs & Stratton 8 B-H
Job 2: Disassemble and Repair Rewind, Clinton A VS 400 (Fairbanks Morse)
Job 3: Repair Recoil Starter, Lauson V-17

### Unit IV - Magneto Ignition

R.S.A. 1: Magnetism and Electricity
Job 1: Repair Ignition System, Briggs & Stratton 8 B-H
Job 2: Repair Ignition System, Briggs & Stratton Model 8
Job 3: Repair Ignition System, Clinton VS 800

R.S.A. 2: Magneto Construction and Operation
Job 4: Repair Ignition System, Clinton AVS-400
Job 5: Repair Ignition System, Lauson V-17, Wico Magneto
Job 6: Repair Ignition System, Power Products Type 710112, Phelon Magneto

### Unit V - Fuel System

R.S.A. 1: Carburetion and Fuel System
Job 1: Repair and Adjust Carburetor and Governor, Briggs & Stratton 8 BH (Float Type)
Job 2: Repair and Adjust Carburetor and Governor, Briggs and Stratton, Model 8 (Gravity Feed Carburetor, Air Vane Governor)

## Course Outline (Continued)

### Unit V - Fuel System (Continued)

R.S.A. 2: Governors
R.S.A. 3: Repair and Adjust Carburetor and Governor, Clinton VS 800 (Carter Type N)

Job 4: Repair and Adjust Carburetor and Governor, Clinton A VS 400; Clinton Carburetor Type LMG - 13

Job 5: Repair and Adjust Carburetor and Governor, Lauson V 17, Walbro Carburetor

Job 6: Repair and Adjust Carburetor and Governor, Power Products Type 710112, Tillotson Carburetor Series MT 33A

Job 7: Repair Diaphragm Carburetor, Tillotson HL Series

### Unit VI - Applications

R.S.A. 1: Types and Construction of Outboard Lower Units
Job 1: Repair Water Pump and Gear Case Assembly, Johnson Model CD

Job 2: Repair Water Pump and Gear Case, Scott-Atwater 5 H.P., 1954 and up (Powerhead Removed)

R.S.A. 2: Small Engine Clutches
Job 3: Remove and Repair Centrifugal Clutch, Clinton Direct

## TRACTOR MAINTENANCE AND REPAIR

### Unit I - Preventive Maintenance Fundamentals

### PACKAGE #1

Math 1 The Steel Rule
R.S.A. 1 Fastening Devices, Calipers, and Thread Gages
Job 1 Identify Bolts and Nuts

### PACKAGE #2

R.S.A. 2 Drills, Taps, and Dies
Job 2 Make Internal Thread Block and Studs
J.I.S. 1 Tools (For use with Job 2)

## Course Outline (Continued)

## Unit I - Preventive Maintenance Fundamentals - (Continued).

### PACKAGE #3

| | | |
|---|---|---|
| R.S.A. | 3 | Installing Studs and Removing Broken Studs |
| Job | 3 | Remove a Broken Stud |
| Math | 2 | Addition and Subtraction of Scale Measurements |

### PACKAGE #4

| | | |
|---|---|---|
| R.S.A. | 4 | Soldering |
| Job | 4 | Make a Solder Joint |

### PACKAGE #5

| | | |
|---|---|---|
| Job | 5 | Start, Operate and Stop Tractor |

### PACKAGE #6

| | | |
|---|---|---|
| R.S.A. | 5 | Hand Tools and How to Use |
| Job | 6 | Identify Hand Tools |

### PACKAGE #7

| | | |
|---|---|---|
| R.S.A. | 6 | Tire Service |
| Job | 7 | Remove, Repair, and Replace Tire and Tube |

### PACKAGE #8

| | | |
|---|---|---|
| Math | 3 | Addition and Subtraction of Whole Numbers |
| R.S.A. | 7 | Lubrication |
| Job | 8 | Lubricate Tractor |

### PACKAGE #9

| | | |
|---|---|---|
| R.S.A. | 8 | Lubricating Oils and Oil Filters |
| Job | 9 | Drain, Flush, Refill Crankcase and Service Oil Filter |

### PACKAGE #10

| | | |
|---|---|---|
| R.S.A. | 9 | Battery Service |
| Job | 10 | Service a Battery |

### PACKAGE #11

| | | |
|---|---|---|
| R.S.A. | 10 | Cooling Systems |
| Job | 11 | Flush Cooling System |

Course Outline (Continued)

Unit II - Front Axle and Steering Gear

PACKAGE #12

R.S.A. 11 Front Wheel Service
Job 12 Remove, Repack, and Adjust Front Wheel Bearings
Math 4 Multiplication in Whole Numbers

PACKAGE #13

R.S.A. 12 Front Axles
Job 13-B Set Toe-In (Ford, 8N)
Job 13-C & E Set Toe-In (Farmall, Super-A and Case, LA)
Math 5 Division of Whole Numbers

PACKAGE #14

R.S.A. 13 Reamers and Reaming
Job 14-B Renew Spindle Bushings (Ford, 8N)
Job 14-C Rebush Steering Knuckles (Farmall, Super-A)
Job 14-E Renew Kingpin Bushings (Case, LA)
Job 15-B Renew Axle Pin Bushing (Ford, 8N)
Job 15-C Renew Axle Pivot Shaft Bushings (Farmall Super-A)
Job 15-E Renew Axle Pivot Shaft Bushing (Case L.A.)
Math 6 Changing Fractions

PACKAGE #15

Job 16-A Renew Vertical Spindle Bushing (John Deere-B)
Job 17-A Repair Roll-O-Matic (John Deere-B)
Job 18-D Renew Front Wheel Felt Washers (Allis-Chalmer, W.C.)
R.S.A. 14 Steering Gears and Adjustment
Job 19-A Adjust Steering Gear (John Deere-B)

PACKAGE #16

Job 19-B Adjust Steering Gear (Ford, 8N)
Job 19-D Adjust Steering Gear (Allis-Chalmers, W.C.)
Job 19-E Adjust Steering Gear (Case, LA)
R.S.A. 15 Tie Rod Ends and Universal Joints
Job 20-B Overhaul Steering Gear (Ford, 8N)
Job 20-C Overhaul Steering Gear (Farmall, Super-A)
Job 20-E Overhaul Steering Gear (Case, LA)

Unit III - Cooling System

PACKAGE #17

R.S.A. 16 Radiators and Radiator Service

Course Outline (Continued)

Unit III - Cooling System (Continued)

PACKAGE #17

| | | |
|---|---|---|
| Math | 7 | Addition and Subtraction of Fractions |
| Job | 21 | Remove and Repair Radiator |

PACKAGE #18

| | | |
|---|---|---|
| R.S.A. | 17 | Fans and Fan Drives |
| Math | 8 | Multiplication of Fractions |
| Job | 22-A | Repair Fan Assembly (John Deere-B) (Hood and Radiator Removed) |
| Job | 22-C | Repair Fan Assembly (Farmall Super-A) |
| Job | 23-A | Check and Repair Ventilator Pump (John Deere-B) (Fan Assembly Removed) |

PACKAGE #19

| | | |
|---|---|---|
| Math | 9 | Division of Fractions |
| R.S.A. | 18 | Water Pumps |
| Job | 24-B | Remove, Repair, and Replace Water Pump (Ford 8N) |
| Job | 24-D | Remove, Repair, and Replace Water Pump (Allis-Chalmer WC) |
| Job | 24-E | Remove, Repair, and Replace Water Pump (Case LA) |

PACKAGE #20

| | | |
|---|---|---|
| R.S.A. | 19 | Thermostats, Shutters, and Temperature Gages |
| Job | 25 | Remove, Check, and Replace Thermostat (Radiator Drained) |

Unit IV - Attachments

PACKAGE #21

| | | |
|---|---|---|
| R.S.A. | 20 | Power Take-offs and Drawbars |
| Job | 26-C | Remove, Repair, and Replace Power Take-Off (Farmall, Super-A) (To be performed with Job No. 27-C) |
| Job | 26-D | Remove, Repair, and Replace Power Take-Off (Allis-Chalmers W.C.) |
| Job | 26-E | Remove, Repair, and Replace Power Take-Off (Case LA) |

PACKAGE #22

| | | |
|---|---|---|
| Math | 10 | Pulley Speeds and Sizes |
| R.S.A. | 21 | Belt Pulleys and Pulley Speeds |

Course Outline (Continued)

PACKAGE #22

| | |
|---|---|
| Job 27-B | Remove, Repair, and Replace Belt Pulley (Ford 8N) |
| Job 27-C | Remove, Repair, and Replace Belt Pulley (Farmall, Super-A) (To be performed with Job No. 26-C) |
| Job 27-D | Remove, Repair, and Replace Belt Pulley (Allis-Chalmers W.C.) |

PACKAGE #23

| | |
|---|---|
| Math 11 | The Decimal System |
| R.S.A. 22 | Lighting Systems, Lights and Light Switches |
| Job 28-A | Install Lighting Attachment (John Deere-B) |
| Job 28-B | Install Lighting System (Ford 8N) |
| Job 28-C | Install Lighting System (Farmall, Super-A) |
| Job 28-D | Install Lighting System (Allis-Chalmers, W.C.) |
| Job 28-E | Install Lighting System (Case, LA) |

PACKAGE #24

| | |
|---|---|
| Math 12 | Addition and Subtraction of Decimal Fractions |
| R.S.A. 23 | Basic Hydraulic Principles and General Power Lift Operation |
| R.S.A. 23-A | Powr-Trol and Power Lift (John Deere, B)* |
| R.S.A. 23-B | Hydraulic Control Unit (Case L.A.) |
| R.S.A. 23-C | Touch-Control System (Farmall, Super A) |
| R.S.A. 23-E | Hydraulic Control Unit (Case L.A.) |
| Job 26-B | Remove and Repair Power Take-Off Shaft (Ford 8N) |
| Job 29-A | Repair Powr-Trol (John Deere-B) |
| Job 29-B | Remove, Repair, and Replace Hydraulic Control (Ford, 8N) |
| Job 29-C | Remove, Repair, and Replace Touch Control (Farmall, Super-A) |
| Job 29-D | Remove, Repair, and Replace Mechanical Lift (Allis-Chalmers, W.C.) |
| Job 29-E | Remove, Repair, and Replace Hydraulic Control Unit (Case, LA) |

Unit V - Rear Axle, Final Drive, and Brakes

PACKAGE #25

| | |
|---|---|
| Math 13 | Multiplication of Decimal Fractions |
| R.S.A. 24 | Bearings, Seals and Closures |
| Job 30-C | Remove, Repair and Reassemble Final Drive (Farmall, Super-A) |
| Job 30-D | Disassemble, Repair, and Reassemble Final Drive (Allis-Chalmers, WC) |
| R.S.A. 25 | Tractor Final Drives |
| Job 33-D | Remove, Repair, and Replace Brakes (Allis Chalmers W.C.) (Final Drive Disassembled) |

Course Outline (Continued)

PACKAGE #26

| | |
|---|---|
| R.S.A. 26 | Types of Rear Axles and Their Adjustment |
| Job 31-A | Remove and Renew Rear Axle Bearings or Seals (John Deere-B) |
| Job 31-B | Remove and Renew Rear Axle Bearings or Seals (Ford 8N) |
| Job 31-E | Remove and Renew Rear Axle Bearings or Seals (Case, LA) |

PACKAGE #27

| | |
|---|---|
| Math 14 | Division of Decimals |
| R.S.A. 27 | Brakes |
| Job 32-A | Adjust Brakes (John Deere-B) |
| Job 32-B | Adjust Brakes (Ford 8N) |
| Job 32-C | Adjust Brakes (Farmall, Super-A) |
| Job 32-D | Adjust Brakes (Allis Chalmers, WC) |
| Job 32-E | Adjust Brakes (Case, LA) (Mechanical-Internal Expanding) |
| Job 32-E | Adjust Hydraulic Brakes (Case, LA) (Minor Adjustment) |
| Job 32-E | Adjust Hydraulic Brakes (Case, LA) (Major Adjustment) |
| Job 32-X | Adjust Disc Type Brakes (All Models) |
| Job 33-A | Remove, Repair, and Replace Brakes (John Deere-B) |
| Job 33-B | Disassemble, Repair and Reassemble Brakes (Ford 8N) (Wheel and Brake Drum Removed) |
| Job 33-E | Remove, Repair, and Replace Brakes (Case, LA) |
| Job 33-E | Disassemble, Repair, and Reassemble Brakes (CASE, LA) (Hydraulic Brakes |
| Job 33-X | Remove, Repair, and Replace Disc Brakes (All Models) |

Unit VI - Differential

PACKAGE #28

| | |
|---|---|
| Math 15 | Changing Common Fractions to Decimals |
| Math 16 | The Micrometer |
| R.S.A. 28 | Ring Gear and Pinion Adjustments |
| Job 34-C | Adjust Ring Gear and Pinion (Farmall, Super-A) (Final Drive Removed) |
| Job 34-D | Adjust Ring Gear Backlash (Allis-Chalmers, WC) |
| R.S.A. 29 | Differential Construction and Operation |
| Job 35-A | Remove, Repair, and Reassemble Differential (John Deere-B) |
| Job 35-B | Remove, Repair, and Reassemble Differential (Ford, 8-N) |

Course Outline (Continued)

PACKAGE #28

| | |
|---|---|
| Job 35-C | Remove, Repair, and Reassemble Differential (Farmall, Super-A) |
| Job 35-D | Remove, Repair and Reassemble Differential (Allis Chalmers, WC.) |
| Job 35-E | Remove, Repair, and Reassemble Differential (Allis Chalmers, WC.) |
| Job 36-D | Disassemble, Repair, and Reassemble Torque Tube (Allis-Chalmers, WC.) |
| R.S.A. 30 | Getting and Holding a Job |

Unit VII - Transmissions

PACKAGE #29

| | |
|---|---|
| R.S.A. 31 | Transmission Shifter Mechanism |
| Job 37-A1 | Disassemble, Repair, and Reassemble Shifter Mechanism (John Deere-B) (Differential Removed) (Serial No. B-9600 to B-201000) |
| Job 37-A2 | Disassemble, Repair, and Reassemble Shifter Mechanism (John Deere-B) (Differential Removed) (Serial No. B-201000 and Up) |
| Job 37-B | Disassemble, Repair, and Reassemble Shifter Mechanism (Ford, 8-N) (Differential Removed) |
| Job 37-C | Remove, Repair, and Replace Shifter Mechanism (Farmall, Super-A) |
| Job 37-D | Remove, Repair, and Replace Shifter Mechanism (Allis-Chalmers, WC.) |
| Job 37-E | Repair and Replace Shifter Mechanism (Case, LA.) (Differential Removed) |

PACKAGE #30

| | |
|---|---|
| Math 17 | Gear Ratios |
| R.S.A. 32 | Transmissions |
| R.S.A. 32-A1 | Transmission Construction and Operation (John Deere-B, Serial No. B-96000 to B-201000) |
| Job 38-A1 | Disassemble, Repair, and Reassemble Transmission (John Deere-B) (Differential and Shifter Mechanism Removed) (Serial No. B-96000 to B-201000) |
| R.S.A. 32-A2 | Transmission Construction and Operation (John Deere-B) (Serial No. 201000 and up) |
| R.S.A. 38-A2 | Disassemble, Repair, and Reassemble Transmission (John Deere-B) (Serial No. B-201000 and Up) (Differential and Shifter Mechanism Removed) |

Course Outline (Continued)

PACKAGE #30

| | | |
|---|---|---|
| R.S.A. | 32-B | Transmission Construction and Operation (Ford, 8-N) |
| Job | 38-B | Disassemble, Repair, and Reassemble Transmission (Ford, 8-N) (To be Performed with Job No. 37-B) |
| Job | 38-C | Disassemble, Repair, and Reassemble Transmission (Farmall, Super A.) (Differential and Torque Tube Removed) |
| Job | 38-D | Remove, Repair, and Replace Transmission (Allis-Chalmers, W.C.) (Differential and Torque Tube Removed) |
| Job | 38-E | Disassemble, Repair, and Reassemble Transmission (Case, LA) (Differential and Shifter Mechanism Removed) |
| Job | 26-A | Remove and Repair Power Shaft (John Deere-B) |

Unit VIII - Clutches

PACKAGE #31

| | | |
|---|---|---|
| R.S.A. | 33 | Types of Clutches; Care and Operation |
| Math | 18 | Simple Percentage |
| Job | 39-A | Repair and Adjust Clutch, Farmall A, B, or C |
| Job | 39-B | Repair and Adjust Clutch, Allis-Chalmers WD |
| Job | 39-C | Repair and Adjust Clutch, Ford 8N |
| Job | 39-D | Repair and Adjust Clutch, John Deere B |

Unit IX - Fuel Systems

PACKAGE #32

| | | |
|---|---|---|
| R.S.A. | 34 | Fuel Supply and Replace Carburetor |
| Job | 40-A | Remove, Repair, and Replace Carburetor, Farmall A, B, or C |
| Job | 40-B | Remove, Repair, and Replace Carburetor, Allis-Chalmers WD. |
| Job | 40-C | Remove, Repair, and Replace Carburetor, Ford 8N |
| Job | 40-D | Remove, Repair, and Replace Carburetor, John Deere B |

PACKAGE #33

| | | |
|---|---|---|
| R.S.A. | 35 | Governors, Types and Operations |
| Math | 19 | Discount |
| Job | 41-A | Remove, Repair, and Replace Governor, Farmall A, B, or C |
| Job | 41-B | Remove, Repair, and Replace Governor, Allis Chalmers WD |

Course Outline (Continued)

PACKAGE #33

| | | |
|---|---|---|
| Job | 41-C | Remove, Repair, and Replace Governor, Ford 8N |
| Job | 41-D | Remove, Repair, and Replace Governor, John Deere B |

Unit X - Magneto Ignition

PACKAGE #34

| | | |
|---|---|---|
| R.S.A. | 36 | Magnetism and Electricity |
| R.S.A. | 37 | Magneto Construction and Operation |
| Job | 42-A | Disassemble, Repair and Reassemble Magneto, Farmall A, B, or C |

PACKAGE #35

| | | |
|---|---|---|
| R.S.A. | 38 | Impulse-Starter Couplings; Timing and Care of the High-Tension Magneto |
| Math | 20 | Personal Checks and Drafts |
| Job | 42-B | Disassemble, Repair and Reassemble Magneto, Allis-Chalmers WD |
| Job | 42-C | Disassemble, Repair and Reassemble Magneto, (John Deere B) |

Unit XI - Battery Ignition

PACKAGE #36

| | | |
|---|---|---|
| R.S.A. | 39 | Types and Requirements of Battery Ignition Systems |
| Job | 43-B | Disassemble, Repair, and Reassemble Distributor, Allis-Chalmers WD |

PACKAGE #37

| | | |
|---|---|---|
| R.S.A. | 40 | Coils, Condensers, Contact Points, Distributor, and Spark Plugs |
| Job | 43-C | Disassemble, Repair, and Reassemble Face Mounted Distributor, Ford 8N |
| Job | 43-D | Disassemble, Repair, and Reassemble Angle Mounted Distributor, Ford 8N |
| Job | 43-E | Remove, Clean, Adjust and Replace Spark Plugs |

Unit XII - Cranking Motors

PACKAGE #38

| | | |
|---|---|---|
| R.S.A. | 41 | Operating Principles of Cranking Motors and Drives |
| Math | 21 | Work Orders and Bills |
| Job | 44 | Remove, Overhaul, and Replace Cranking Motor |

Course Outline (Continued)

## Unit XIII - Generators

### PACKAGE #39

| | | |
|---|---|---|
| R.S.A. | 42 | Generator Construction and Operation |
| Job | 45 | Remove, Disassemble, Repair and Replace a Generator |

### PACKAGE #40

| | | |
|---|---|---|
| R.S.A. | 43 | Cutout Relays and Step-voltage Controls |
| Math | 22 | Keeping Accounts |
| Job | 46 | Remove, Check, and Adjust Step-Voltage Control |

## Unit XIV - Engines

### PACKAGE #41

| | | |
|---|---|---|
| R.S.A. | 44 | Engine Fundamentals |
| Job | 47 | Clean Engine With Cold or Hot Degreasing Solution |
| Job | 48 | Remove and Replace Expansion Plug |

### PACKAGE #42

| | | |
|---|---|---|
| R.S.A. | 45 | Valve Types and Construction |
| R.S.A. | 46 | Valve Mechanisms |
| Job | 49 | Reface Rocker Arms |

### PACKAGE #43

| | | |
|---|---|---|
| R.S.A. | 47 | Valve Service |
| Job | 50 | Remove, Clean, and Replace Rocker Arms |
| Job | 51 | Grind Valves on I-Head Engine |
| Job | 52 | Grind Valves on L-Head Engine |

### PACKAGE #44

| | | |
|---|---|---|
| R.S.A. | 48 | Pistons, Piston Rings, Cylinders and Sleeves |
| Job | 58 | Remove Old and Install New Piston Rings |
| Job | 59 | Remove Old and Install New Cylinder Sleeves, Dry Type |
| Job | 60 | Remove and Install Cylinder Sleeve, Wet Type |
| Job | 61 | Rebore Cylinder |
| Job | 62 | Hone Cylinder and Fit Piston |

### PACKAGE #45

| | | |
|---|---|---|
| R.S.A. | 49 | Piston Pins and Bushings, Connecting Rods, Crankshaft and Main Bearings |

Course Outline (Continued)

PACKAGE #45

| | | |
|---|---|---|
| Job | 53 | Remove Old and Fit New Piston Pins and Bushings |
| Job | 54 | Install New Ring Gear on Flywheel |
| Job | 55 | Adjust Connecting Rod Bearings With Engine in Tractor, John Deere (Shim Type) |
| Job | 56 | Install New Connecting Rod Bearings With Engine in Tractor (Insert Type) |
| Job | 57 | Adjust Main Bearings, John Deere B |

PACKAGE #46

| | | |
|---|---|---|
| R.S.A. | 50 | Engine Lubrication Systems |
| Job | 63 | Remove, Inspect, and Replace Oil Pump |

PACKAGE #47

| | | |
|---|---|---|
| Job | 64 | Overhaul Engine Completely (Except John Deere) |

PACKAGE #48

| | | |
|---|---|---|
| Job | 65 | Overhaul Engine Completely, John Deere B |

WELDING

Unit I - Welding - Oxyacetylene

Job No. 1: Safety Rules for Oxyacetylene Welding
Mathematics
Related-Technical Information

Job No. 2: Set Up Oxyacetylene Welding Equipment
Mathematics
Related-Technical Information

Job No. 3: Regulate Oxygen and Acetylene Pressure and Light a Torch
Mathematics
Related-Technical Information

Job No. 4: The Cutting Torch and Flame Cutting Steel
Mathematics
Related-Technical Information

Job No. 5: Flat Welding Without Filler Rod
Mathematics
Related-Technical Information

Course Outline (Continued)

Job No. 6: Flat Welding with Filler Rod (All Joints)
Mathematics
Related-Technical Information

Job No. 7: Vertical Welding (All Joints)
Mathematics
Related-Technical Information

Job No. 8: Vee Butt (Overhead)
Mathematics
Related-Technical Information

Job No. 8A: Fillet Weld (Overhead)
Mathematics
Related-Technical Information

Job No. 9: Butt Weld, Forehand - Backhand (Horizontal)
Mathematics
Related-Technical Information

Job No. 10: Bronze Weld Steel
Mathematics
Related-Technical Information

Job No. 11: Bronze Weld Cast Iron
Mathematics
Related-Technical Information

Job No. 12: Low Temperature Brazing
Mathematics
Related-Technical Information

Job No. 13: Welding Aluminum
Mathematics
Related-Technical Information

Job No. 14: Special Projects
Mathematics
Related-Technical Information

Job No. 15: Butt Weld Pipe (Roll)
Mathematics
Related-Technical Information

Job No. 16: Butt Weld Pipe Fixed Position Bellhole
Mathematics
Related-Technical Information

Job No. 17: Butt Weld Pipe Fixed Position Horizontal
Mathematics
Related-Technical Information

Course Outline (Continued)

Unit II - Welding - Arc

- Job No. 1: Shop Safety
  - Blueprint Reading
  - Mathematics
  - Related-Technical Information
- Job No. 2: Use and Care of Equipment
  - Blueprint Reading
  - Mathematics
  - Related-Technical Information
- Job No. 3: Stringer Beads (Flat)
  - Blueprint Reading
  - Mathematics
  - Related-Technical Information
- Job No. 4: Continuous Stringer Beads
  - Blueprint Reading
  - Mathematics
  - Related-Technical Information
- Job No. 5: Weave Beads
  - Blueprint Reading
  - Mathematics
  - Related-Technical Information
- Job No. 6: Tee Joint (Flat)
  - Blueprint Reading
  - Mathematics
- Job No. 7: Outside Corner Joint (Flat)
  - Blueprint Reading
  - Mathematics
  - Related-Technical Information
- Job No. 8: V-Butt Joint - Back-up Strip (Flat)
  - Blueprint Reading
  - Related-Technical Information
- Job No. 9: V-Butt Joint - Open (Flat)
  - Blueprint Reading
  - Related-Technical Information
- Job No. 10: Lap Joint (Horizontal)
  - Blueprint Reading
  - Related-Technical Information
- Job No. 11: Tee Joint - Stringer Beads (Horizontal)
  - Blueprint Reading
  - Related-Technical Information

Course Outline (Continued)

Job No. 12: Tee Joint - Weave Bead (Horizontal)
Blueprint Reading
Related-Technical Information

Job No. 13: Stringer Beads on Horizontal Plate (Horizontal)
Blueprint Reading
Related-Technical Information

Job No. 14: V-Butt Joint - Back-up Strip (Horizontal)
Blueprint Reading

Job No. 15: V-Butt Joint - Open (Horizontal)
Blueprint Reading

Job No. 16: Stringer Beads - Travel Down (Vertical)
Blueprint Reading
Related-Technical Information

Job No. 17: Lap Joint - Travel Down (Vertical)
Blueprint Reading
Related-Technical Information

Job No. 18: Stringer Beads, Travel Up (Vertical)
Blueprint Reading

Job No. 19: Weave Beads, Vertical Position
Blueprint Reading

Job No. 20: Lap Joint, Vertical Position
Blueprint Reading

Job No. 21: Tee Joint, Vertical Position
Blueprint Reading

Job No. 22: Outside Corner Joint, Vertical Position (Vertical)
Blueprint Reading

Job No. 23: V-Butt Joint - Back-up Strip (Vertical)
Blueprint Reading

Job No. 24: V-Butt Joint - Open (Vertical)
Blueprint Reading

Job No. 25: Stringer Beads (Overhead)
Blueprint Reading

Job No. 26: Weave Beads

Job No. 27: Lap Joint (Overhead)

Course Outline (Continued)

Job No. 28: Tee Joint - Stringer Beads (Overhead)

Job No. 29: Tee Joint, Overhead - Weaved Bead Technique

Job No. 30: V-Butt Joint, Backup Strip (Overhead)

Job No. 31: V-Butt Joint, Open (Overhead)

Job No. 32: Butt Joint, Pipe (Roll Weld)
Layout
Related-Technical Information

Job No. 33: Butt Joint Pipe (Fixed Position)
Layout
Related-Technical Information

Job No. 34: Butt Weld Pipe (Horizontal Position)
Layout
Related-Technical Information

Job No. 35: Two Piece 90° Turn
Layout
Related-Technical Information

Job No. 36: Tee Weld
Layout
Related-Technical Information

Job No. 37: "Y" In Fixed Position
Layout

The Fundamental Electrical Course was published in 1955 and revised in 1962. It is available in the following forms:

| | |
|---|---|
| Book I | |
| Related Study Assignments | Units I & II |
| Jobs | Units I & II |
| Book II | |
| Related Study Assignments | Units III, IV, & V |
| Jobs | Units III, IV, & V |
| Book III | |
| Related Study Assignments | Unit VI |
| Jobs | Unit VI |
| Book IV | |
| Related Study Assignments | Units VII, VIII, & IX |
| Jobs | Units VII, VIII, & IX |
| Book V | |
| Related Study Assignments | Units X & XI |
| Jobs | Units X & XI |

Mathematics
    All Math is included in the Related Study Assignment Books I - V

| | |
|---|---|
| Test Books | |
| Book I | Units I & II |
| Book II | Units III, IV, & V |
| Book III | Unit VI |
| Book IV | Units VII, VIII, IX, X, & XI |

Answer Book
    Complete for tests and math

The following instructor's aids are available:
    Progress Chart
    Individual folder type

The references for the Electrician Course are the following

| Title | Source |
|---|---|
| Hausmann, Erich<br>SWOOPE'S LESSONS IN PRACTICAL ELECTRICITY | D. Van Nostrand Co., Inc.,<br>120 Alexandria Street<br>Princeton, New Jersey |
| Loper, Orla E.<br>DIRECT CURRENT FUNDAMENTALS | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |

References (Continued)

| Title | Source |
|---|---|
| Uhl, Dunlap, and Flynn<br>INTERIOR ELECTRIC WIRING AND ESTIMATING--RESIDENTIAL | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| Richter, H. P.<br>PRACTICAL ELECTRICAL WIRING | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| THE NATIONAL ELECTRICAL CODE | The National Board of Fire Underwriters<br>85 John Street<br>New York 38, New York |
| Cooke, Nelson M.<br>BASIC MATHEMATICS FOR ELECTRONICS | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| DUAL ELEMENT FUSE CATALOG | Bussman Mfg. Division<br>University at Jefferson<br>St. Louis 7, Missouri |
| 250) 700) Manual - Instruction Sheets<br>--Rotating Electrical Machinery (Navy Common Core)<br>--Crow Rotating Electric Machine - Zitzman | Universal Scientific Co., Inc.<br>1312 S. Thirteenth Street<br>Vincennes, Indiana |
| Duff, John R.<br>BASIC ELECTRICITY 2<br>(A. C. FUNDAMENTALS) | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Nadon, John M. and Gelmine, Bert J.<br>INDUSTRIAL ELECTRICITY | D. Van Nostrand Co., Inc.<br>120 Alexander Street<br>Princeton, New Jersey |
| WESTINGHOUSE LIGHTING HANDBOOK | Westinghouse Electric Supply Company<br>1299 Northside Drive, N. W.<br>Atlanta 2, Georgia |
| Rasch, William Edward<br>PRACTICAL ELECTRICAL MATHEMATICS | D. C. Heath and Co.<br>285 Columbus Avenue<br>Boston 16, Massachusetts |

References (Continued)

| Title | Source |
|---|---|
| Rosenberg, Robert<br>ELECTRIC MOTOR REPAIR | Holt, Rinehart and Winston, Inc.<br>383 Madison Avenue<br>New York 17, New York |
| Crouse, William H.<br>AUTOMOTIVE ELECTRICAL EQUIPMENT | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| DELCO-REMY, 12 Volt Electrical Equipment for 1958 Cars, DR-5210 | Delco-Remy Division<br>General Motors Corporation<br>Anderson, Indiana |
| STEEL ELECTRICAL RACEWAYS | American Iron and Steel Institute<br>150 East Forty-second Street<br>New York 17, New York |
| Abbott, Arthur L.<br>THE NATIONAL ELECTRICAL CODE HANDBOOK | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Graham, Kennard C.<br>NATIONAL ELECTRICAL CODE AND BLUEPRINT READING | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| CHROMALOX ELECTRIC COMFORT HEATING | Edwin L. Wiegand Co.<br>7500 Thomas Blvd.<br>Pittsburgh 8, Pa. |
| NEMA MANUAL FOR ELECTRIC HOUSE HEATING | National Electrical Mfgs. Association<br>115 East 44 Street<br>New York 17, New York |
| ELECTRICAL BLUEPRINT READING AND SKETCHING-RESIDENTIAL | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Crouse, William H.<br>ELECTRICAL APPLIANCE SERVICING | McGraw-Hill Book Co.<br>330 West 42nd Street<br>New York 36, New York |
| Gibbs, J. B.<br>TRANSFORMER PRINCIPLES AND PRACTICE | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |

References (Continued)

| Title | Source |
|---|---|
| ELECTRICAL METERMAN'S HANDBOOK<br>Terms and Definitions | Edison Electric Institute<br>420 Lexington Avenue<br>New York 17, New York |
| Braymer, Daniel H. and Roe, A. C.<br>REWINDING SMALL MOTORS | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Veinott, Cyril G.<br>FRACTIONAL HORSEPOWER ELECTRIC MOTORS | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Heine, Dunlap, and Jones<br>HOW TO READ ELECTRICAL BLUEPRINTS | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| Van Valkenburgh, Nooger, Neville, Inc.<br>BASIC SYNCHROS AND SERVOMECHANISMS | John F. Rider Publisher, Inc.<br>116 West 14th Street<br>New York 11, New York |
| Crow, Leonard R.<br>LEARNING ELECTRICITY AND ELECTRONICS EXPERIMENTALLY | Educational Publishers, Inc.<br>St. Louis, Missouri |
| GENERAL DESCRIPTION FOR D. C. VARIABLE DRIVE | Fidelity Instrument Corporation<br>100 E. Boundary Avenue<br>York, Pennsylvania |
| DESCRIPTION OF OPERATION AND SERVICE INSTRUCTIONS, MODEL F-29B SPEED REGULATOR | Fidelity Instrument Corporation<br>100 E. Boundary Avenue<br>York, Pennsylvania |

A detailed outline of the Fundamental Electrical Course follows.

Unit I - Fundamental Theory of Electricity

| | | |
|---|---|---|
| R.S.A. | 1 | Care and Use of Hand Tools and Equipment |
| Job | 1 | Identify Hand Tools in Your Shop |
| R.S.A. | 2 | Hack Saws, Hack Saw Blades, Vise, and Ruler |
| Job | 2 | Cut Conduit and Wire to Specified Length |
| R.S.A. | 3 | Electron Theory and Static Charges |
| Job | 3 | Prove Laws of Electrical Charges and Effects of Static Charges |
| R.S.A. | 4 | Electric Current and Electron Flow |
| Job | 4 | Produce Electron Movement and Current Flow |

## Unit I - Fundamental Theory of Electricity (Continued)

| | | |
|---|---|---|
| R.S.A. | 5 | Voltage, Current, Resistance and Conductance |
| R.S.A. | 6 | Properties of Magnets and Magnetic Fields |
| Job | 6 | Determine the Polarity of Magnets and the Existence of Magnetic Field |
| R.S.A. | 7 | Electromagnetism and Electromagnets |
| Job | 7A | Perform Oersted's Experiment of Magnetic Effects of an Electric Current |
| Job | 7B | Make an Electromagnet and Study its Characteristics |
| R.S.A. | 8 | Means of Developing Electromotive Forces |
| Job | 8 | Produce E.M.F. by Three Different Methods |
| R.S.A. | 9 | Primary Cells |
| Job | 9 | Testing Voltage and Amperage of a Dry Cell, and Methods of Connecting Dry Cells |
| R.S.A. | 10 | Secondary Cells |
| Job | 10 | Construct and Test Secondary or Storage Cells |

## Unit II - Principles of Direct Current

| | | |
|---|---|---|
| R.S.A. | 1A | Care and Use of Power Operated Tools |
| Job | 1A | Installing Fasteners in Masonry Construction |
| R.S.A. | 1B | Types of Fasteners |
| Job | 1B | Installing Fasteners in Masonry Construction |
| R.S.A. | 2 | Tap Drill Figures |
| Job | 2 | Lay Out Plate For Drilling |
| Job | 3 | Figure Tap Drill Sizes |
| Job | 4 | Drilling |
| Job | 5 | Taps and Tapping |
| R.S.A. | 3 | Types of Wire and Cable and The Use of The American Wire Gauge and Micrometer |
| R.S.A. | 4 | Wire Connections and Soldering |
| Job | 6 | Make a Rat-tail Splice, a Tap Splice and a Fixture Splice |
| Job | 7 | Make a Western-Union Splice and a Cable Splice |
| Job | 8 | Soldering Wires in Terminal Lugs |
| R.S.A. | 5 | Mathematics - Ohm's Law--Series Circuits |
| Job | 9 | Construct a Series Circuit and Take Voltage and Ammeter Readings |
| R.S.A. | 6 | Mathematics - Ohm's Law--Parallel Circuits |
| Job | 10 | Construct a Parallel Circuit and Take Voltage and Ammeter Readings |
| R.S.A. | 7 | Mathematics - Ohm's Law--Series Parallel Circuits |
| Job | 11 | Construct a Series Parallel Circuit and Take Voltage and Ammeter Readings |
| R.S.A. | 8 | Circuit Sketching, Cells in Series, Parallel and Series-Parallel |
| Job | 12 | Connect Cells in Series, Parallel and Series and Parallel and Take Voltage Reading |

## Unit II - Principles of Direct Current (Continued)

| | | |
|---|---|---|
| R.S.A. | 9 | Low Voltage Signal Circuits |
| Job | 13A | Connect 2 Vibrating Bells in Parallel, Using 1 Push Button and 2 Cells in Series |
| Job | 13B | Wire a Department Return-Call Bell Circuit, Using Single-Contact Push Buttons |
| Job | 13C | Connect and Install a Department Return-Call System Using Four Department Bells and One Master Bell With Eight Single-Contact Push Buttons |
| Job | 13D | Connect a Six-Point Manual-Reset Annunciator to be Controlled from Six Single-Contact Push Buttons |
| R.S.A. | 10 | Fuses and Circuit Breakers |
| Job | 14 | Test for Blown Fuses in Fuse Panel, Using a Test Socket and a Lamp Bulb |
| R.S.A. | 11 | Power in Direct Current Circuits |
| Job | 15 | Determine the Power in a D.C. Circuit |
| R.S.A. | 12 | Principles of Dynamo-Electric Machines |
| Job | 16 | Construct a Direct Current Generator |
| R.S.A. | 13 | Problems Concerning Conductors |
| Job | 17A | Learn How Electrical Resistance Varies With the Kind of Material Used |
| Job | 17B | Learn How the Resistance of a Conductor Varies With Its Length |
| Job | 17C | Measure Voltage Drop in a Circuit |
| R.S.A. | 14 | Direct Current Meters |
| Job | 18 | Construct an Experimental Ammeter |

## Unit III - Principles of Alternating Current

| | | |
|---|---|---|
| Math | 1 | Introduction to Trigonometry |
| Math | 2 | Trigonometric Functions |
| Math | 3 | Tables of Functions |
| Math | 4 | Solution of Right Triangles |
| Math | 5 | Periodic Functions |
| Math | 6 | Elementary Plane Vectors |
| R.S.A. | 1A | Alternating Currents and Voltages |
| R.S.A. | 1B | Care and Use of Portable Meters and Indicating Devices |
| Job | 1 | Assemble, Connect and Test Run a Single Phase Alternator |
| R.S.A. | 2 | Alternating Current Meters |
| Job | 2 | Convert a D'Arsonval Meter Movement to Measure Alternating Current Voltage |
| R.S.A. | 3A | Study the Oscilloscope |
| Job | 3A | Operation of the Oscilloscope |
| R.S.A. | 3B | Study Voltage Calibrator |
| Job | 3B | Use of the Voltage Calibrator |
| R.S.A. | 4 | Resistance and Power in AC Circuits |
| Job | 4 | Watts and Power Factor Resistor Circuits |
| R.S.A. | 5A | Inductance |
| R.S.A. | 5B | Inductance in AC Circuits |

## Unit III - Principles of Alternating Current (Continued)

| | | |
|---|---|---|
| Job | 5 | Watts and Power Factor of Inductor Circuits |
| R.S.A. | 6A | Capacitance |
| R.S.A. | 6B | Capacitance in AC Circuits |
| Job | 6 | Watts and Power Factor of Capacitors |
| R.S.A. | 7A | Impedance in AC Series Circuits |
| Job | 7A | Watts and Power Factor of Series Inductance, Capacitance Circuit |
| R.S.A. | 7B | Resistance, Inductance and Capacitance in AC Parallel Circuits |
| Job | 7B | Watts and Power Factors of Parallel Inductance, Capacitance Circuit |
| R.S.A. | 7C | Series-Parallel AC Circuits |
| R.S.A. | 8 | Study the Capacitance or Condenser Tester |
| Job | 8 | Capacitor Testing |
| Job | 9A | Inductor-Resistor Phase Shift Circuit |
| Job | 9B | Capacitor-Resistor Phase Shift Circuit |
| R.S.A. | 10A | Power Factor |
| R.S.A. | 10B | Power in Single Phase Circuits |
| Job | 10A | Check Power Factor of a Single Phase Load (Leading and Lagging) |
| Job | 10B | Check Power Factor of Single Phase Motor Full Load |
| R.S.A. | 11 | Principles of Alternating Current |
| Job | 11A | Connect and Meter the Current and Voltage in a 3-Phase Star Connected Circuit |
| Job | 11B | Connect and Meter the Current and Voltage in a 3-Phase Delta Connected Circuit |
| R.S.A. | 12 | Power Transformers |
| Job | 12 | Assemble, Connect and Test Input and Output of Single Phase Transformer |
| R.S.A. | 13 | Instrument Transformers |
| Job | 13A | Connect Potential Transformers for Metering |
| Job | 13B | Connect Current Transformers for Metering |

## Unit IV - Lighting

| | | |
|---|---|---|
| R.S.A. | 1 | Facts About Lighting |
| Job | 1 | Measure Light With Light Meter |
| R.S.A. | 2 | Types of Lamps |
| Job | 2 | Construct Single-Lamp Fluorescent Light |
| R.S.A. | 3 | Computing Electric Light and Power Bills |
| Job | 3 | Read Meter and Calculate Bill |

## Unit V - Motors and Generators

| | | |
|---|---|---|
| R.S.A. | 1 | Direct Current Generators |
| Job | 1 | Construct a Separately-Excited D.C. Generator |
| R.S.A. | 2 | Direct Current Motors |
| Job | 2 | Construct a Series-Wound D.C. Generator and Motor |

### Unit V - Motors and Generators (Continued)

| | | |
|---|---|---|
| Job | 3 | Construct a Shunt Wound D.C. Generator and Motor |
| Job | 4 | Disassemble and Clean Commercial Type Shunt Motor or Generator |
| Job | 5 | Construct a Compound Wound Generator and Motor |
| Job | 6 | Disassemble and Clean Commercial Type Compound Wound Generator or Motor |
| R.S.A. | 3 | The Growler |
| Job | 7 | Armature Testing With a Growler |
| R.S.A. | 3A | Generators |
| Job | 8 | Test a Compound Motor for Grounds and Open Circuit |
| Job | 9 | Experiment on Resistance Testing of a D.C. Compound Motor |
| Job | 10 | Determine the horsepower of A.C. and D.C. Electric Motors |
| R.S.A. | 4 | Principles of Alternating Current Motors |
| Job | 11 | Construct an A.C. Induction Motor--Four Pole--Split Phase--Starting Winding |
| Job | 12 | Construct an A.C. Split Phase Motor-Capacitor Start, Also Capacitor Start, Capacitor Run |
| Job | 13 | Construct an A.C. Shaded Pole Motor |
| Job | 14 | Construct a 3-Phase Induction Motor, 6-Pole, 12-Coil Field |
| R.S.A. | 5 | Automotive Generator Service |
| Job | 15 | Disassemble and Repair Automotive Generator |

### Unit VI - Wiring Methods

| | | |
|---|---|---|
| R.S.A. | 1 | General Provisions of the National Electrical Code |
| Job | 1 | Connect a Light Controlled by a Single Pole Toggle Switch |
| R.S.A. | 2 | General Requirements for Wiring Methods |
| Job | 2 | Connect Two Lights in Series Controlled by a Single Pole Toggle Switch. Exposed Knob Method |
| R.S.A. | 3 | Types of Boxes, Box Covers, Box Extensions and Methods of Installation |
| Job | 3 | Connect Two Lights in Parallel Controlled by a Single Pole Toggle Switch. Exposed Knob Method. |
| R.S.A. | 4 | Polarity Identification of Systems and Circuits |
| Job | 4 | Connect a Ceiling Light Controlled by a Single Pole Toggle Switch. Concealed Knob and Tube. |
| R.S.A. | 5 | Types of Cables and Fittings |
| Job | 5 | Connect One Ceiling Light and One Receptacle, Each Controlled by a Single Pole Toggle Switch, Concealed Knob and Tube |
| R.S.A. | 6 | Branch Circuits and Service Entrance |
| Job | 6 | Install a Two Wire Service Entrance Using Two Wire Entrance Cable, a Socket Type Meter Base, and a Six Circuit-Breaker Panel |

## Unit VI - Wiring Methods (Continued)

| | | |
|---|---|---|
| R.S.A. | 7 | Non-Metallic Cable or Romex Wiring |
| Job | 7 | Install Two Circuits Using Non-Metallic Cable (Romex) |
| R.S.A. | 8 | Armored Cable Wiring |
| Job | 8A | Install a 3-Wire Service Entrance, Use 3-Wire Entrance Cable, Socket Type Meter Base and a Six-Circuit Breaker Panel |
| Job | 8B | Install 3 Circuits Using Armored Cable (BX) |
| R.S.A. | 9 | Schematic Diagraming and Wiring Plans |
| Job | 9 | Install Two Circuits Using Romex Cable |
| R.S.A. | 10 | Installing Surface Metal Raceway |
| Job | 10A | Installing Surface Metal Raceway<br>Install No. 200 Wiremold From Existing Baseboard Receptacle, to Single Pole Toggle on Wall to Control Ceiling Light |
| Job | 10B | Installing Surface Metal Raceway<br>Install No. 1900 Wiremold From Existing Baseboard Receptacle to an Extension of 5 Receptacles |
| R.S.A. | 11 | Bending Conduit and Tubing with Hand Benders |
| Job | 11 | Bend Conduit and Electrical Metallic Tubing |
| R.S.A. | 12 | Installing Conduit |
| Job | 12A | Install a 3-Wire Service Entrance Using 1" Conduit and a Six-Circuit Breaker Panel |
| Job | 12B | Installing Conduit<br>Install 2 Circuits Using 1/2" Conduit |
| R.S.A. | 13 | Methods of Pulling Conductors in Raceways |
| Job | 13 | Pull Wires into Conduit and Connect |
| R.S.A. | 14 | Use of N.E.C. Tables for Calculating the Number of Conductors in Conduit or Tubing |
| Job | 14 | Install a Ceiling Light Controlled by Two 3-Way Switches. Install Two 120-Volt Receptacles. Install a Three Wire 240-Volt Circuit |
| R.S.A. | 15 | Building Structures and Architectural Symbols |
| Job | 15 | Install 1/2" E.M.T. and Wire |
| R.S.A. | 16 | Wiring in Hazardous Locations |
| Job | 16 | Hazardous and Non-hazardous Installation |
| R.S.A. | 17 | Installing Wireways, Busways, Auxiliary Gutters, and Cellular Metal Raceways |
| Job | 17 | Installing Square-Duct and Wiring Using a Square-Duct Wiring Trough. Install From a Main Switch 3 Motors of Different Sizes Each Controlled by a Separate Switch |
| R.S.A. | 18 | Garages, Service Stations, and Bulk Storage Plants |
| Job | 18 | Wiring in Inflammable Areas |
| R.S.A. | 19 | Installation Practice of Lighting Fixtures |
| Job | 19 | Wire With Romex |
| R.S.A. | 20 | Practical Blueprint Reading |
| Job | 20 | Submit Bid on Single-Family Dwelling |
| R.S.A. | 21 | Application of Home Heating |
| Job | 21 | Electric Bathroom Heater Installation |

## Unit VI - Wiring Methods (Continued)

| | | |
|---|---|---|
| R.S.A. | 22 | Remote Control Switching |
| Job | 22 | Wiring Remote Controlled Lighting Low Voltage Switching |
| R.S.A. | 23 | Cooking Appliances |
| Job | 23 | Install Electric Range Circuit, Energize and Trouble Shoot |
| R.S.A. | 24 | Electric Hot Water Heaters and Gas Furnace Controls |
| Job | 24 | Install Low-Voltage-Control Circuit for Gas Furnace |
| R.S.A. | 25 | Metering Polyphase Circuits With and Without Instrument Transformers |
| Job | 25A | Connect Voltmeter and Ammeter With the Voltmeter Reading Line Voltage Only |
| Job | 25B | Connect Wattmeter in a Single-Phase Circuit |
| R.S.A. | 26 | Illumination Design Data for Interiors |
| Job | 26 | Measure Length and Width of Wiring Booth and Figure the Number and Size of Fixtures Needed to Produce Approximately 60 Foot Candles of Lighting, 4-Feet From the Floor |
| R.S.A. | 27 | Calculations for Illuminating an Industrial Shop |
| Job | 27 | Plan and Lay Out Lighting in Shop Building by the "Lumen Method of Calculation." |
| R.S.A. | 28 | Calculating Wiring for an Industrial Shop |
| Job | 28 | Submit Bid for Complete Wiring of the Two School Shops |
| R.S.A. | 29 | Calculating, Wiring, and Illumination for Paint Shop and Finishing Room |
| Job | 29 | Submit Bid for Complete Wiring of Paint Shop and Finishing Room |
| R.S.A. | 30 | Characteristics and Working Principles of Fluorescent Lamps |
| Job | 30 | Reconnect a Two-Lamp (40 Watts Each) Fluorescent Pre-heat Type Fixture |
| R.S.A. | 31 | Circuit Sketching - Fluorescent Lamps |
| Job | 31 | Reconnect a Two-Lamp (40 Watts Each) Instant Start Fluorescent Type Fixture |
| R.S.A. | 32 | N.E.C. Requirements for Lighting Fixtures, Signs and Outline Lighting |
| Job | 32 | Calculate Wiring for Light and Power for Grocery Store |
| R.S.A. | 33 | Estimating Material for Roughing-in a Single Family Dwelling |
| Job | 33 | Estimate Cost of Material and Labor for Family Dwelling |

## Unit VII - Direct Current Motor Control

| | | |
|---|---|---|
| R.S.A. | 1 | Manual Starting Rheostats for Direct Current Motors |
| Job | 1 | To Study the Connections and Operation of a Three-Terminal Starting Rheostat |

## Unit VII - Direct Current Motor Control (Continued)

| | | |
|---|---|---|
| Job | 2 | Install and Connect Shunt Motor, Safety Switch and Three-Terminal Starting Box. All Wiring to be Done in Rigid Conduit |
| Job | 3 | Wire and Connect a Compound D.C. Motor to a Three-Terminal Starting Box and Safety Switch. All Wiring is to be in Rigid Conduit According to Your Own Layout |
| Job | 4 | Wire and Connect a Compound D.C. Motor to a Four-Terminal Starting Box and Safety Switch. All Wiring is to be in E.M.T. According to Your Own Layout |
| R.S.A. | 2 | Manual Speed Controllers for Direct Current Motors |
| Job | 5 | Manual Speed Controller Connections and Operation |
| Job | 6 | Load - Speed Test of a Shunt Motor |
| Job | 7 | Load - Speed Test of a Compound Motor |
| Job | 8 | Efficiency of a D.C. Motor |
| R.S.A. | 3 | Drum Controllers |
| Job | 9 | Connect a Shunt Motor to a Three-Terminal Starting Rheostat and Reversing Switch |
| Job | 10 | Connect a Compound Motor to a Four-Terminal Starting Rheostat and Reversing Switch |
| Job | 11 | Connect a Shunt Motor to a Drum Reversing Switch |
| Job | 12 | Connect a Start-Stop Station to a D.C. Full Voltage Starter and Shunt Motor |
| Job | 13 | Connect Two Start-Stop Stations to a D.C. Full Voltage Starter and Shunt Motor |
| Job | 14 | Connect Three Start-Stop Stations to a D.C. Full Voltage Starter and a Compound Motor |
| Job | 15 | Automatic Acceleration of D.C. Motors |
| Job | 16 | Definite Time Method of Acceleration of a D.C. Motor |
| Job | 17 | Connect a Start-Job-Stop Station to a Reduced Voltage Magnetic Starter and Compound Motor |
| Job | 18 | Connect a Reduced-Voltage Magnetic Starter Equipped With Dynamic Braking to a Compound Motor |
| Job | 19 | Automatic Acceleration With Dynamic Braking and Reversing |
| R.S.A. | 4 | Automatic Motor Control |

## Unit VIII - Alternating Current Motors Controllers and Alternators

| | | |
|---|---|---|
| R.S.A. | 1 | Insulating Materials and Wire |
| Job | 1 | Measure Thickness of Slot Insulation Paper and Wire Size Before and After Insulation has Been Removed |
| R.S.A. | 2 | Split Phase Motors |
| Job | 2 | Rewind and Test a Split-Phase Motor |
| R.S.A. | 3 | Capacitor Motors |
| Job | 3 | Rewind and Test a Capacitor-Start Motor |

## Unit VIII - Alternating Current Motors Controllers and Alternators (Continued)

| | | |
|---|---|---|
| R.S.A. | 4 | Current Relays |
| Job | 4 | Install and Connect a Current Relay |
| R.S.A. | 5 | Voltage Relay |
| Job | 5 | Install and Connect a Voltage Relay |
| R.S.A. | 6 | Repulsion Induction Motor |
| Job | 6 | Repair Repulsion-Induction Motors |
| R.S.A. | 7 | Three-Phase Motors |
| Job | 7 | Rewind and Connect a Three-Phase Fractional Horsepower Motor |
| R.S.A. | 8 | N.E.C. Specifications for Motors and Controllers |
| Job | 8 | Calculate Wiring for Three-Phase Motor and Controller |
| R.S.A. | 9 | Wiring for Motors |
| Job | 9 | Installation of Magnetic Starter and Raceway for a 3 H.P. Three-Phase Motor |
| R.S.A. | 10 | Across-the-Line Magnetic Starters |
| Job | 10 | Wire and Connect Control for Installed Magnetic Starter and Motor |
| R.S.A. | 11 | Reversing Magnetic Starter |
| Job | 11 | Install Wires and Connect Reversing Magnetic Starter |
| R.S.A. | 12 | Reduced Voltage Starter |
| Job | 12 | Wire and Connect Starting Compensator to Motor |
| R.S.A. | 13 | Drum, Two Speed and Quick Stop Controller |
| Job | 13 | Connect Wiring of Two Speed Controller to Motor |
| R.S.A. | 14 | Synchronous Drive and Indicating Systems |
| Job | 14 | Connect a Synchro Generator and Motor |
| R.S.A. | 15 | Alternators |
| Job | 15 | Connect and Test a Three-Phase Alternator |
| R.S.A. | 16 | Synchronizing and Phasing Alternators |
| Job | 16 | Phasing out and Connect Two Alternators in Parallel |
| R.S.A. | 17 | Calculating Necessary Data for Wiring Wound Rotor Motors |
| Job | 17 | Connect Wiring of Wound Rotor |

## Unit IX - Transformer Principles and Practices

| | | |
|---|---|---|
| R.S.A. | 1 | Power Transformers |
| Job | 1 | Build a Simple Transformer |
| R.S.A. | 2 | Checking Polarity of Transformers |
| Job | 2 | Connect a Single Phase Transformer With Series-Parallel Secondary for Polarity Check |
| R.S.A. | 3 | Single Phase Transformer Connections |
| Job | 3A | Connect a Single Phase Transformer With Series-Parallel Secondary for Series Operation and Take Voltage Readings |
| Job | 3B | Connect a Single Phase Transformer With Series-Parallel Secondary for Parallel Operation and take Voltage Readings |

Unit IX - Transformer Principles and Practices (Continued)

| | | |
|---|---|---|
| R.S.A. | 4 | Special Application of Transformers |
| Job | 4 | Connect Two Single Phase Transformers in Parallel and Take Voltage Readings |
| Job | 5 | Make a Sketch of a Common Type Single-Phase Distribution Transformer Used as a Booster |
| R.S.A. | 5 | Three Phase Transformer Connections |
| Job | 6 | Connect Three Single Phase Transformers for 3-Phase, Four Wire, Wye-Wye Operation, and Take Voltage Readings |
| Job | 7 | Connect 3 Single Phase Transformers for 3 Phase, Four Wire, Wye-Delta Operation and Take Voltage Readings |
| Job | 8 | Connect 3 Single-Phase Transformers For 3-Phase, Four Wire; Delta-Delta Operation and Take Voltage Readings |
| Job | 9 | Connect 3 Single-Phase Transformers for 3 Phase, Four Wire, Delta-Wye Operation and Take Voltage Readings. |
| Job | 10 | Connect Two Single-Phase Transformers for 3-Phase Open Delta Operation and Take Voltage Readings |
| R.S.A. | 6 | Metering Single Phase Circuits Without Instrument Transformers |
| Job | 11 | Make a Neat Sketch of a Type S, 3-Wire, Single Phase, Self-Contained Meter Connected to a Load Center. Identify the current and potential coils and their connections. Explain in writing the functions of the meter parts. |
| R.S.A. | 7 | Instrument Transformers |
| Job | 12 | Make a Sketch of a Potential Transformer Connected to a Voltmeter. Show a 20 to 1 Voltage Ratio and Explain all Parts on Your Sketch. |
| R.S.A. | 8 | Metering Single Phase Circuits With Instrument Transformers |
| Job | 13 | Make a Neat Sketch of a Single Unit Current Transformer Connected to a Type S Meter Socket Metering a 3 Wire Line. Name All Parts on Your Sketch. |
| Job | 14 | Make a Sketch of a Three-Wire Single-Phase Service Being Metered Using Instrument Current Transformer For Both Type A and S Meters |
| Job | 15 | Make a Sketch of a Three Wire Line Using a 2 Wire Transformer |
| R.S.A. | 9 | Metering Polyphase Circuits With and Without Instrument Transformers |
| Job | 16 | Make a Sketch of a Type S Meter Self-Contained, Measuring Energy in a Three Phase Delta Circuit. Show all Connections and Name All Coils |

Unit IX - Transformer Principles and Practices (Continued)

| | | |
|---|---|---|
| Job | 17 | Make a Sketch and Show the Connections for a Polyphase Watt Hour Meter on a 3-Phase, 3-Wire Circuit, Using Both Instrument Current and Potential Transformers. Show Potential Instrument Transformers Connected Open Delta |
| Job | 18 | Make a Sketch of Metering a 4-Wire Wye Circuit With a 3 Phase, 3 Element Meter. Show Potential Transformers Connected Wye-Wye. Name all Coils on Your Sketch. |

Unit X - Fundamental Electronics

| | | |
|---|---|---|
| R.S.A. | 1 | Vacuum Tubes as Rectifiers |
| Job | 1 | Build and Study a Vacuum Tube Rectifier |
| R.S.A. | 2 | Solid State Rectifiers |
| Job | 2 | Construct a Selenium Rectifier Circuit |
| R.S.A. | 3 | Rectifier Filters |
| Job | 3 | Construct Filter for Rectifier |
| R.S.A. | 4 | Triode Tube |
| Job | 4 | Study Characteristics of Triode Tube |
| R.S.A. | 5 | Operation Gas Filled Tube |
| Job | 5 | Connect and Test a Three Phase Rectifier |
| R.S.A. | 6 | Thyratron Tube |
| Job | 6 | Test an Automatic Battery Charger |
| R.S.A. | 7 | Photo-Cells and Controls |
| Job | 7 | Connect and Test a Phototube Relay |
| R.S.A. | 8 | Electronic Motor Controls |
| Job | 8 | Connect and test an Electronic Control for D.C. Shunt Motor |
| R.S.A. | 9 | Magnetic Amplifier Control in D.C. |
| Job | 9 | Connect and Test Magnetic Motor Control for D.C. Shunt Motor |
| R.S.A. | 10 | Magnetic Amplifier Control A.C. |
| Job | 10 | Connect and Test Magnetic Amplifier for 3-Phase Motor Control |
| R.S.A. | 11 | Amplidyne Drive System |
| Job | 11 | Assemble an Amplidyne Drive System, Test and Operate |

Unit XI - Welding and Cutting

| | | |
|---|---|---|
| R.S.A. | 1 | Functions and Operating Principles of Oxy-acetylene, Regulators, Blowpipes, and Accessories |
| Job | 1 | To Set Up Oxy-Acetylene Cutting Equipment |
| R.S.A. | 2 | Setting Up Oxy-Acetylene Equipment |
| Job | 2 | To Cut Steel Plate With Oxy-Acetylene Cutting Torch |
| R.S.A. | 3 | Oxy-Acetylene Cutting |
| Job | 3 | To Make Beads on Flat Plate Without Using Filler Rod |
| R.S.A. | 4 | Oxy-Acetylene Welding |
| Job | 4 | To Deposit Beads on Flat Plate Using Filler Rod |

Unit XI - Welding and Cutting (Continued)

| | | |
|---|---|---|
| Job | 5 | To Make a Butt Weld on Mild Steel Strips in Flat Position |
| Job | 6 | To Bronze Weld Lap Joint of Mild Steel Strips |
| Job | 7 | To Silver Solder a Lap Joint of Copper |
| Job | 8 | To Strike an Arc and Deposit Beads on Flat Plate With Shielded-Arc Electrodes |
| R.S.A. | 5 | Characteristics of Arc Welding |
| Job | 9 | To Deposit Weave Bead on Flat Plate Between Stringer Bead Using Straight Polarity Electrodes |
| R.S.A. | 6 | Types of Electrodes |
| R.S.A. | 7 | Characteristics of Inert Gas Welding |
| Job | 10 | To Make a Tee Joint in Flat Position Using Straight Polarity Electrodes |
| Job | 11 | To Start The Arc and Run Stringer Bead on Aluminum Plate |
| Job | 12 | To Deposit Stringer Beads on Flat Aluminum Plate Using Filler Metal |

Drafting is a study of the fundamental science or language of graphic expression. The exact thinking necessary to visualize or form mental pictures of intricate shapes, and describe them with lines, requires concentrated mental effort and application.

The course in Industrial Drafting herein outlined is designed for beginners, with aims to develop the ability of the student in the language and operations of drafting as well as present the latest developments in industry. The outline is offered in the form of instructional material and problems, for full understanding and ability in drafting comes only through application of principles in a variety of progressively difficult experiences.

The course as outlined covers thirty-one units with one hundred forty problems, to be completed in approximately 1560 clock hours of instruction. The outline has fifteen units with eighty problems in the first part, and sixteen units with sixty problems in the second part.

It is anticipated that the necessary mathematics which the student will require in the various assignments and problems will be incorporated in and taught concurrently with the practical exercises of each lesson.

The references for the Industrial Drafting are the following:

| Title | Source |
|---|---|
| French and Svenson<br>MECHANICAL DRAWING | McGraw-Hill Book Company<br>330 West 42nd Street<br>New York 36, New York |
| Giesecke, Mitchell & Spencer<br>TECHNICAL DRAWING | Macmillan Book Co.<br>60 5th Avenue<br>New York 11, New York |
| French and Vierich<br>ENGINEERING DRAWING | McGraw-Hill Book Co.<br>330 West 42nd Street<br>New York 36, New York |

A detailed outline of Industrial Drafting follows.

## PART I - Instructional Material

A. Basic Operations
   1. Select grade of pencil
   2. Sharpen a drawing pencil
   3. Make erasures
   4. Keep drawing clean
   5. Fasten paper to board

B. Use of instruments
   1. Mark off measurements from scale
   2. Draw horizontal lines
   3. Draw vertical lines
   4. Lay out drawing sheet
   5. Draw to scale
   6. Draw inclined lines at standard angles
   7. Draw lines parallel to any given line
   8. Draw circles and arc
   9. Set off equal distances on a line with dividers
   10. Mark off angles from a protractor

C. Lettering

D. Geometric Construction
   1. Bisect a line
   2. Divide a line into any number of equal parts
   3. Bisect an angle
   4. Draw an arc tangent to non-parallel lines
   5. Draw an arc tangent to a straight line and an arc
   6. Draw an arc tangent to two arcs
   7. Draw a tangent to two unequal circles

E. Freehand Sketching
   1. Sketch straight lines freehand
   2. Sketch circles and arcs
   3. Make a planning sketch

F. Conventional Lines
   1. Represent visible outlines
   2. Represent hidden lines
   3. Show centers and axes by center lines
   4. Draw extension and dimension lines
   5. Make arrowheads
   6. Draw and identify line of section by cutting plane line
   7. Draw section lines
   8. Draw break lines

G. Dimensioning and Notes
   1. Dimensioning a prism, hexagon, octagon, pyramid
   2. Dimension a circle
   3. Dimension a cylindrical part
   4. Dimension arcs
   5. Dimension a conical part
   6. Dimension round end shapes, round holes
   7. Dimension angles

G. Dimensioning and Notes (Continued)
   8. Dimension an irregular curve, irregular part
   9. Dimension details of a part
   10. Dimension over-all size
   11. Dimension and specify tapers
   12. How to place notes
H. Graphic Representation
   1. Determine the required views
   2. Center views on the sheet
   3. Draw the required views of a two-view drawing
   4. Develop a third view from two views
I. Orthographic Projection
   1. Project the principal view of a prismatic solid
   2. Draw an auxiliary view
J. Sectional Views
   1. Draw a full sectional view
   2. Draw a half sectional view
   3. Draw a partially broken out sectional view
K. Detail and Assembly Drawings
   1. Make detail drawing
   2. Make assembly drawing from detail drawing
L. Pattern Drawings
   1. Laying out square or rectangular pattern
   2. Laying out cylindrical pattern
   3. Laying out radial-shaped patterns
   4. Intersection of a cylinder with a flat plane
   5. Intersection of cylinders with like diameters
   6. Intersection of cylinders with unlike diameters
   7. Angle intersection of cylinders of like diameters
   8. Angle intersection of cylinders of unlike diameters
   9. Square and rectangular intersection
   10. Rectangular 90° duct elbow
   11. Transition of rectangular to round section
M. Gears
   1. Make conventional working drawing of gears
N. Fasteners
   1. American Standard 60° V-thread
   2. Bolt
   3. Stud
   4. Set screws
   5. Carriage bolts
   6. Machine bolts
   7. Stove bolts
   8. Wood screws
   9. Self-tapping screws
O. Pictorial Drawings
   1. Isometric drawings
   2. Oblique drawings
   3. Cabinet drawing
   4. Parallel perspective drawings
   5. Angular perspective drawings

Part I - Problems

A. Basic Operations
    Plate 1. Fasten paper to board
B. Use of instruments
    Plate 1. Lay out drawing sheet
    Plate 2. Horizontal lines, vertical lines, inclined lines at standard angles, lines parallel to any given line
    Plate 3. Circles and arcs, set off equal distances on line with dividers, mark angles from protractor
C. Lettering
    Plate 4. Lettering
D. Geometric Construction
    Plate 5. Geometric Construction
E. Freehand sketching
    Plate 6. Sketch straight lines, sketch circles and arcs
    Plates 7, 8, 9. Make a planning sketch
F. Conventional lines
    Plate 10. Conventional lines
G. Dimensioning and Notes
    Plate 11. Dimensioning
H. Graphic Representation
    Plates 12, 13, 14. Two view drawings
    Plates 15, 16, 17, 18, 19. Develop third view from two views
I. Orthographic Projection
    Plates 20, 21, 22, 23. Project principal view of prismatic solid
    Plates 24, 25, 26. Auxiliary view
J. Sectional Views
    Plates 27, 28, 29, 30, 31, 32. Sectional Views
K. Detail and Assembly Drawings
    Plates 33, 34, 35, 36, 37. Assembly drawings
    Plates 38, 39. Make detail drawing
L. Pattern Drawings
    Plates 40, 41, 42. Laying out rectangular pattern
    Plates 43, 44, 45. Intersection of cylinder with like diameter
    Plates 46, 47. Rectangular 90° duct elbow
    Plate 48. Transition of rectangular to round section
M. Gears
    Plates 49, 50. Spur gears
    Plates 51, 52. Bevel gears
N. Fasteners
    Plate 53. American Standard 60° V-thread
    Plate 54. Thread symbols
    Plate 55. Machine bolt
    Plate 56. Thread symbols

Part I - Problems (Continued)

O. Pictorial Drawings
  Plates 57, 58, 59, 60, 61, 62. Isometric drawings
  Plates 63, 64, 65, 66, 67, 68. Oblique drawings
  Plates 69, 70, 71, 72, 73, 74. Cabinet drawings
  Plates 75, 76, 77, 78, 79. Parallel perspective drawings
  Plates 80, 81, 82, 83, 84. Angular perspective drawings

Part II - Instructional Material

A. Lettering
    1. Form single stroke letters and numerals
    2. Letter titles and notes
B. Blueprint Reading
    1. Three-view drawings
        a. Horizontal and vertical surfaces
        b. Slanting surfaces
        c. Hidden lines
        d. Scales
    2. Two-view drawings
        a. Curved surfaces
        b. Fractional tolerance
        c. Decimal tolerance
        d. Angular tolerance
C. Sectional Drawings
    1. Special types of sections
D. Assembly Drawings
    1. Detail drawings
    2. Assembly drawings
    3. Bills of material
    4. Inking of drawings
E. Orthographic Projection
    1 Auxiliary views
    2. Revolutions
F. Intersections and Developments
    1. Intersection of a cylinder with a flat plane
    2. Angle intersection of cylinders of like diameters
    3. Square and rectangular intersection
    4. Intersection and development of two prisms
G. Pipe, Fittings, and Valves
    1. Steel and wrought-iron pipe
    2. Cast-iron pipe
    3. Seamless brass and copper pipe
    4. Aluminum pipe
    5. Copper water tubes

G. Pipe, Fittings, and Valves
    6. Pipe joints
    7. Globe valve
    8. Check valves
    9. Gate valves
    10. Piping drawings
    11. Dimensioning
H. Pictorial Drawings
    1. Axonometric projection
        a. Isometric
        b. Dimetric
        c. Trimetric
    2. Oblique projection
        a. Oblique drawings
        b. Reduction of length of receding axis
        c. Four-center ellipse
        d. Oblique sections
    3. Perspective
        a. Simple perspective
        b. Multiview perspective
        c. Angular perspective
        d. One-point perspective
        e. Two-point perspective
        f. Three-point perspective
I. Shading
J. Graphs
    1. Rectangular
    2. Composite
    3. Bar
    4. Area
    5. Circular
    6. Polar
    7. Organization
    8. Alignment
K. Architectural Design
    1. General drawings
    2. Dimensioning
    3. Detail drawings
    4. Brick and tile construction
M. Topographic Drawings
    1. Scale
    2. Conventional symbols
    3. Profiles
    4. Contours
    5. Maps from field notes
N. Reproduction Process

O. Optional Drawings and Blueprint Reading
  1. Aeronautical drafting and blueprint reading
  2. Mechanical drafting and blueprint reading
  3. Electrical drafting and blueprint reading
  4. Welding drawings and blueprint reading
  5. To be selected by instructor

Part II - Problems

A. Lettering
  Plate 1. Inclined lettering; letter titles and notes
B. Blueprint Reading
  1. Three-view drawings
    Plate 2. Horizontal and vertical surfaces
    Plate 3. Slanting surfaces
    Plate 4. Hidden lines; scales
  2. Two-view drawings
    Plates 5, 6, 7, 8. Curved surfaces
      Fractional tolerances
      Decimal tolerances
      Angular tolerances
  3. One-view drawings
    Plates 9, 10. One-view drawings
C. Sectional Drawings
  Plate 11. Removed sections
  Plate 12. Offset sections
  Plate 13. Conventional violations
D. Assembly Drawings
  Plate 14. Detail drawing
  Plate 15, 16. Assembly drawings, bills of material, inking of drawing
E. Orthographic Projection
  Plates 17, 18. Auxiliary views
  Plates 19, 20. Revolutions
F. Intersections and Developments
  Plate 21. Intersection of cylinder with a flat plane
  Plate 22. Angle intersection of cylinders of like diameters
  Plate 23. Square and rectangular intersections
  Plate 24. Intersection and development of two prisms
G. Pipes, Fittings, and Valves
  Plate 25. Single-line drawing of piping layout and system
  Plate 26. Double-line drawing of piping layout and system
  Plate 27. Single-line isometric drawing of piping layout
H. Pictorial Drawing
  1. Axonometric projection
    Plates 28, 29. Isometric
    Plates 30, 31. Dimetric
    Plates 32, 33. Trimetric

2. Oblique projection
    - Plate 34. Oblique
    - Plate 35. Reduction of length of receding axis
    - Plate 36. Oblique with four-center elipse
    - Plate 37. Oblique sections
3. Perspective
    - Plate 38. Simple perspective
    - Plate 39. One-point perspective
    - Plate 40. Two-point perspective
    - Plate 41. Three-point perspective

I. Shading
Plates 42, 43. Shade lines
Plates 44. Surface shading

J. Graphs
Plate 45. Rectangular graph
Plate 46. Circular graph
Plate 47. Organization chart

K. Architectural Design
Plate 48. General plans and elevations
Plate 49. Detail drawings

L. Structural Drawings
Plate 50. Wood construction
Plate 51. Steel and iron construction
Plate 52. Reinforced concrete, brick and tile construction

M. Topographic Drawings
Plate 53. Profiles
Plate 54. Contours
Plate 55. Maps from field notes

N. Reproduction Processes
(Film and field trip)

O. Optional Drawings and Blueprint Reading
Plates 56, 57. Select two of the following:
1. Aeronautical drafting and blueprint reading
2. Electrical drafting and blueprint reading
3. Mechanical drafting and blueprint reading
4. Welding drawing and blueprint reading
5. To be selected by instructor

The Industrial Engines Course was published in 1957 and revised in 1963-1964. It is available in the following forms:

Related Study Assignments and Job Sheets

Book I
- Unit I - Benchwork
- Unit II - Overhaul, Cleaning and Inspection
- Unit III - Auxiliary Equipment

Book II
- Unit IV - Diesel Fuel Systems
- Unit V - Welding

Test Book
- Book I - Units I - V

Answer Book
- Book I - Units I - V

The references for the Industrial Engines Course are the following:

| Title | Source |
|---|---|
| ABC'S OF HAND TOOLS | General Motors Corporation<br>General Motors Building<br>3044 West Grand Blvd.<br>Detroit 2, Michigan |
| GENERAL REPAIR TOOLS FOR AUTO MECHANICS | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Ludwig<br>METALWORK TECHNOLOGY AND PRACTICE | McKnight and McKnight<br>109-111 West Market Street<br>Bloomington, Illinois |
| Kates<br>DIESEL AND HIGH COMPRESSION GAS ENGINES FUNDAMENTALS | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| SERVICE MANUAL FOR THE DOCTOR OF MOTORS | Perfect Circle Corporation<br>Hagerstown, Indiana |
| DOCTOR OF MOTORS, PRESCRIPTION FOR BETTER DIESEL ENGINE OVERHAUL | Perfect Circle Corporation<br>Hagerstown, Indiana |
| Maleev, V. L.<br>DIESEL ENGINE OPERATION AND MAINTENANCE | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |

References: (Continued)

| Title | Source |
|---|---|
| SERVICE MANUAL, SERIES 71 | General Motors Corporation<br>Detroit Diesel Engine Div.<br>13400 West Outer Drive<br>Detroit 28, Michigan |
| SERVICE MANUAL, SERIES 110 | General Motors Corporation<br>Detroit Diesel Engine Div.<br>13400 West Outer Drive<br>Detroit 28, Michigan |
| SERVICE MANUAL | Le Roi Company<br>Milwaukee 14, Wisconsin |
| DR-324, Bulletin 1G-100, Bulletin 1G-125, Bulletin 1G-155 | Delco-Remy Division<br>General Motors Corporation<br>Anderson, Indiana |
| AUTO-LITE ELECTRICAL EQUIPMENT MAINTENANCE AND OPERATION | The Electric Auto-Lite Co.<br>The Parts and Service Division<br>Toledo, Ohio |
| Delco-Remy Training Chart, Manual 5133H, and Manual 5133M | Delco-Remy Division<br>General Motors Corporation<br>Anderson, Indiana |
| Delco-Remy Bulletin 150 and Bulletins IC-100, ID-100 and ID-115 | Delco-Remy Division<br>General Motors Corporation<br>Anderson, Indiana |
| Purvis, Jud<br>ALL ABOUT SMALL GAS ENGINES | Goodheart-Willcox Co., Inc.<br>1322 South Wabash Avenue<br>Chicago 5, Illinois |
| MOTOR SERVICE'S AUTOMOTIVE ENCYCLOPEDIA | Goodheart-Willcox Co., Inc.<br>1322 South Wabash Avenue<br>Chicago 5, Illinois |
| TR-40, MAINTENANCE OF AUTOMOTIVE ENGINE COOLING SYSTEMS | Society of Automotive Engineers, Inc.<br>485 Lexington Avenue<br>New York 17, New York |
| Frazee-Bedell<br>TRACTORS AND CRAWLERS | American Technical Society<br>848 East Fifty-Eighth Street<br>Chicago 37, Illinois |

References: (Continued)

| Title | Source |
|---|---|
| Elementary Principles of Diesel Engine Governing, Bulletin 01012A | Woodward Governor Co.<br>Rockford, Illinois |
| American Bosch Fuel Injection Equipment Maintenance Information | American Bosch Arma Corporation<br>Springfield 7, Massachusetts |
| Roosa-Master Operation and Instruction Manual | Hartford Machine Screw Co.<br>Hartford 2, Connecticut |
| Roosa-Master Service Manual, Test Specifications | Hartford Machine Screw Co.<br>Hartford 2, Connecticut |
| Shop Manual PT Fuel System Bulletin 983334-D | Cummins Engine Co., Inc.<br>Columbus, Indiana |
| Farmall and International Tractors Fuel Systems | International Harvester Co.<br>10400 West North Avenue<br>Melrose Park, Illinois |
| SERVICEMEN'S REFERENCE BOOK (Caterpillar Service Manual) | Louisiana Machinery Co., Inc.<br>P. O. Box 5544<br>Alexandria, Louisiana |
| FUEL EQUIPMENT SPECIFICATION CATALOGUE | American Bosch Arma Corporation<br>Springfield 7, Massachusetts |
| Colored Chart on PSB Pump | American Bosch Arma Corporation<br>Springfield 7, Massachusetts |

A detailed outline of the Industrial Engines Course follows:

Unit I - Benchwork

| | | |
|---|---|---|
| R.S.A. | 1 | Hand Tools (General) |
| Job | 1 | Hand Tools (General) |
| R.S.A. | 2 | Measuring Devices |
| Job | 2 | Measure Crankshaft and Cylinder with Micrometers |
| R.S.A. | 3 | Fastening Devices |
| Job | 3 | Identify Bolt, Nuts, and Locks |
| R.S.A. | 4 | Abrasives |
| Job | 4 | Using Abrasives (Garnet Cloth, Emery or Sandpaper) |
| Job | 4A | Dressing Bench Grinder Wheel |
| Job | 4B | Reshape Screw Driver, Chisel, and Center Punch, Using Bench Grinder |
| R.S.A. | 5 | Files, Hacksaws, and Bench Vise |
| Job | 5 | Using the File, Hacksaw, and Bench Vise |

Course Outline (Continued)

Unit I (Continued)

| | | |
|---|---|---|
| R.S.A. | 6 | Twist Drills |
| Job | 6 | Sharpen a Twist Drill and Make An Internal Thread Block With Studs |
| R.S.A. | 7 | Threading Dies |
| R.S.A. | 7A | Taps |
| R.S.A. | 7B | Screw Extractors |
| R.S.A. | 7C | "Sewing" Cracked Casting |
| Job | 7 | Threading With Dies |
| Job | 7A | Taps and Tapping |
| Job | 7B | Removing Broken Stud |
| Job | 7C | "Sewing" a Cracked Casting |
| R.S.A. | 8 | Pipe Threads and Tubing |
| Job | 8 | Tubing: Cutting, Flaring, Bending and Identifying Brass Fittings |
| R.S.A. | 9 | Metal Shears |
| R.S.A. | 9A | The Blow Torch |
| R.S.A. | 9B | Soldering |
| Job | 9 | Metal Shear |
| Job | 9A | Filling and Lighting the Blow Torch |
| Job | 9B | Splice Insulated Wire and Make a Solder Joint |

Unit II - Overhaul, Cleaning and Inspection

| | | |
|---|---|---|
| R.S.A. | 1 | Nomenclature and Terminology of Engine |
| Job | 1 | Identify Engine Parts, Determine the Events in a Four and Two Stroke Cycle Engine |
| R.S.A. | 2 | Piston Rings and Cylinder Honing |
| Job | 2 | Piston Rings and Cylinder Honing |
| R.S.A. | 3 | Crankshaft--Connecting Rod Main Bearings and Connecting Rod Bearings |
| Job | 3 | Crankshaft Connecting Rod |
| R.S.A. | 4 | Camshaft and Valve Train |
| Job | 4 | Check Camshaft Bearings and Train |
| R.S.A. | 5 | Part I Valve Timing - Gears and Gear Pullers |
| Job | 5 | Part I Remove and Replace Timing Gears |
| R.S.A. | 5 | Part II Valve Timing Diagrams 2 S.C. and 4 S.C. |
| Job | 5 | Part II Making Valve Timing Diagrams |
| R.S.A. | 6 | Cylinder Head Rebuilding |
| Job | 6 | Cylinder Head Rebuilding |
| R.S.A. | 7 | Flywheels |
| Job | 7 | Flywheel |
| R.S.A. | 8 | Lubricating Systems and Lube Oil Filter |
| Job | 8 | Lubricating System |

Course Outline (Continued)

Unit III - Auxiliary Equipment

| | | |
|---|---|---|
| R.S.A. | 1 | Basic Principles of Electricity, Storage Battery, Battery Charger, and Volt Meter |
| Job | 1 | Servicing Battery |
| R.S.A. | 2 | D-C Generators |
| Job | 2 | Disassemble and Reassemble Generator |
| R.S.A. | 3 | Relays and Regulators for DC Generators |
| Job | 3 | Testing and Adjusting Regulators |
| R.S.A. | 4 | Alternator Generators and Regulator Control |
| Job | 4 | Repair and Test Alternator Generator and Regulator Control |
| R.S.A. | 5 | Electric Cranking Motors Magnetic and Solenoid Switches and Series Parallel Switches |
| Job | 5 | Cranking Motor Magnetic and Solenoid Switches and Series Parallel Switches |
| R.S.A. | 6 | Ignition System |
| Job | 6 | Check and Test All Points in Ignition System |
| R.S.A. | 7 | Carburetion and Fuel Pumps |
| Job | 7 | Clean and Rebuild Carburetor and Fuel Pump |
| R.S.A. | 8 | Air Cleaners |
| Job | 8 | Servicing the Air Cleaner and Distribution System--Inspect Air Ducts |
| R.S.A. | 9 | Engine Cooling Systems |
| Job | 9 | Checking and Servicing Cooling Systems |
| R.S.A. | 10 | Clutches |
| Job | 10 | Remove, Repair, Adjust, and Replace Clutch |

Unit IV - Diesel Fuel Systems

| | | |
|---|---|---|
| R.S.A. | 1 | Governors |
| Job | 1 | Disassemble and Reassemble Governor |
| R.S.A. | 2 | General Motors Fuel Systems |
| Job | 2 | Tune up General Motor Engine |
| R.S.A. | 3 | American Bosch Fuel System |
| Job | 3 | Tune up Engine With Bosch Fuel System |
| R.S.A. | 4 | The Roosa-Master Fuel Pump |
| Job | 4 | Tune up Engine With Roosa-Master Fuel Pump |
| R.S.A. | 5 | Cummins (PT) Fuel System |
| Job | 5 | Tune Cummins Engine With (PT) Fuel System |
| R.S.A. | 6 | International Harvester Fuel System |
| Job | 6 | Tune International Harvester Engine |
| R.S.A. | 7 | Caterpillar Fuel System |
| Job | 7 | Check Fuel Injection System (Caterpillar, all models) |
| R.S.A. | 8 | Rebuilding the Fuel Injection System for General Motors Diesel Engine |
| Job | 8 | Rebuild and Test General Motors Fuel System |
| R.S.A. | 9 | Part I Bosch Fuel Systems |

Course Outline (Continued)

Unit IV - Diesel Fuel Systems

| | | |
|---|---|---|
| Job | 9 | Part I Rebuild, Test and Calibrate an American Bosch Fuel System |
| R.S.A. | 9 | Part II Supply Pump |
| Job | 9 | Part II Rebuild, Test, and Calibrate an American Bosch Fuel System |
| R.S.A. | 9 | Part III The Bosch Fuel Nozzle |
| Job | 9 | Part III Servicing, Adjusting, and Testing the Bosch Nozzle |
| R.S.A. | 9 | Part IV Bosch, PSB Pump |
| Job | 9 | Part IV Rebuild, Test, and Calibrate American Bosch Fuel System |
| R.S.A. | 10 | Rebuilding the Roosa Master Fuel Pump |
| Job | 10 | Rebuild and Test a Roosa Master Fuel Pump |
| R.S.A. | 11 | Rebuilding the Cummins (PT) Fuel System |
| Job | 11 | Rebuild and Test a Cummins Fuel System |
| R.S.A. | 12 | Rebuilding International Harvester Fuel System |
| Job | 12 | International Harvester Fuel System |
| R.S.A. | 13 | Trouble Shooting |
| Job | 13 | Trouble Shooting and Repair of Engine |

Unit V - Welding

| | | |
|---|---|---|
| R.S.A. | 1 | Functions and Operating Principles of Oxy-Acetylene, Regulators, Blowpipes, and Accessories |
| Job | 1 | To Set Up Oxy-Acetylene Cutting Equipment |
| R.S.A. | 2 | Setting Up Oxy-Acetylene Equipment |
| Job | 2 | To Cut Steel Plate With Oxy-acetylene Cutting Torch |
| R.S.A. | 3 | Oxy-Acetylene Cutting |
| Job | 3 | To Make Beads on Flat Plate Without Using Filler Rod |
| R.S.A. | 4 | Oxy-Acetylene Welding |
| Job | 4 | To Deposit Beads on Flat Plate Using Filler Rod |
| Job | 5 | To Make a Butt Weld on Mild Steel Strips in Flat Position |
| Job | 6 | To Bronze Weld Lap Joint of Mild Steel Strips |
| Job | 7 | To Silver Solder a Lap Joint of Copper |
| Job | 8 | To Strike an Arc and Deposit Beads on Flat Plate With Shielded-Arc Electrodes |
| R.S.A. | 5 | Characteristics of Arc Welding |
| Job | 9 | To Deposit Weave Bead on Flat Plate Between Stringer Bead Using Straight Polarity Electrodes |
| R.S.A. | 6 | Types of Electrodes |
| R.S.A. | 7 | Characteristics of Inert Gas Welding |
| Job | 10 | To Make a Tee Joint in Flat Position Using Straight Polarity Electrodes |

Course Outline (Continued)

Unit V (Continued)

| | | |
|---|---|---|
| Job | 11 | To Start the Arc and Run Stringer Bead on Aluminum Plate |
| Job | 12 | To Deposit Stringer Beads on Flat Aluminum Plate Using Filler Metal |

INDUSTRIAL INSTRUMENTS
TECHNOLOGY
Trade Preparatory

The Industrial Instruments Technology Course was published in 1966 and is composed of 5 books--Instructor's Guide, Student Workbook, Reference Book 1, Reference Book 2, and Reference Book 3.

A detailed outline of the Industrial Instruments Technology Course follows:

UNIT I - INDUSTRIAL INSTRUMENT TECHNOLOGY

Section 1 Pressure-Measuring and Transmitting Instruments
Section 2 Differential Pressure-Measuring
Section 3 Velocity and Volumetric Measuring
Section 4 Liquid-Level-Measuring Instruments
Section 5 Temperature-Measuring Instruments
Section 6 Viscosity and Specific-Gravity
Section 7 pH and Redox Measuring Instruments
Section 8 Gas Analyzers
Section 9 Control Valves and Valve Positioners
Section 10 Speed Measurement and Control
Section 11 Repairing and Calibrating Controllers
Section 12 Organization of Instrument Department for Processing Plants
Section 13 Industrial Psychology and Personal Adjustment

UNIT II - PROCESS CONTROL TECHNOLOGY

Section 1 Control Valves
Section 2 Piston-Operated Control Valves
Section 3 Differential Pressure Measurement
Section 4 Temperature-Measuring Instruments
Section 5 Pressure-Measuring Instruments
Section 6 Flow-Measuring Instruments
Section 7 Details of Flow-Measuring Instruments
Section 8 pH and Oxidation Reduction Potential Measurement
Section 9 Distillation and Fractionation Column Control
Section 10 Various Control Techniques
Section 11 Control of Various Processes
Section 12 Reactors

The Machine Shop Course was published in 1955 and revised in 1962. It is available in the following forms:

| | |
|---|---|
| Book I | |
| Related Study Assignments | Unit I |
| Jobs | Unit I |
| Book II | |
| Related Study Assignments | Units II & III |
| Jobs | Units II & III |
| Book III | |
| Related Study Assignments | Unit IV |
| Jobs | Unit IV |
| Book IV | |
| Related Study Assignments | Unit V |
| Jobs | Unit V |

Mathematics
All Math is included in the Related Study Assignment Books I - IV

| | |
|---|---|
| Test Books | |
| Book I | Units I, II, & III |
| Book II | Units IV & V |

Answer Book
Complete for Units I - V

The following instructor's Aids are available:
- Progress Chart
- Individual folder type

The references for the Machine Shop Course are the following:

| Title | Source |
|---|---|
| Giachino and Feirer<br>BASIC BENCH-METAL PRACTICE AND PRECISION MEASURING | Chas. A. Bennett Co., Inc.<br>237 N. Monroe Street<br>Peoria, Illinois |
| BENCH WORK<br>Machine Shop Series | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| MACHINE SHOP MATHEMATICS<br>Machine Shop Series | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |

References (Continued)

| Title | Source |
|---|---|
| Burghardt, Axelrod and Anderson<br>MACHINE TOOL OPERATION, Part I | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Olivo, Thomas C. and Payne, Albert V.<br>BASIC BLUEPRINT READING AND SKETCHING | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Axelrod, Aaron<br>MACHINE SHOP MATHEMATICS | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Oberg, Erik and Jones, F. D.<br>MACHINERY'S HANDBOOK | The Industrial Press<br>93 Worth Street<br>New York 13, New York |
| Burghardt, Axelrod, and Anderson<br>MACHINE TOOL OPERATION, Part II | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| SHAPER WORK<br>Machine Shop Series | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| LATHE WORK<br>Machine Shop Series | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| MILLING MACHINE WORK<br>Machine Shop Series | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |

A detailed outline of the Machine Shop Course follows:

Unit I - Bench and Floor

| | | |
|---|---|---|
| R.S.A. | 1 | Hand Hack Saw |
| Job | 1 | Make Two Screen Spacers |
| R.S.A. | 2 | Laying Out |
| Job | 2 | Make Lever Guides |
| R.S.A. | 3 | Files and Their Uses |
| Job | 3 | Make Two Templates |
| R.S.A. | 4 | Power Driven Saws |
| Job | 4 | Tool Post Wedge |
| R.S.A. | 5 | Abrasives |
| Job | 5 | Make a Cross Feed Pawl |
| R.S.A. | 6 | Offhand Grinding |
| Job | 6 | Make a Drill Gauge |

Unit I - Bench and Floor (Continued)

| | | |
|---|---|---|
| R.S.A. | 7 | Cutting and Shearing |
| Job | 7 | Make Die Block Shims |
| R.S.A. | 8 | Drill Presses and Their Uses |
| Job | 8 | Make an Oil Hole Cover |
| R.S.A. | 9 | Cutting Internal Openings |
| Job | 9 | Transmission End Plate |
| R.S.A. | 10 | Finishing Metal Surfaces |
| Job | 10 | Make a Tool Post Wrench |
| R.S.A. | 11 | Metal Fasteners |
| Job | 11 | Make a Steel Square |
| R.S.A. | 12 | Bending and Shaping |
| Job | 12 | Make Inside Calipers |
| R.S.A. | 13 | Calipers |
| Job | 13 | Make Outside Calipers |
| R.S.A. | 14 | Taps and Tapping |
| Job | 14 | Make Tap Gauge |
| R.S.A. | 15 | Dies and Threading |
| Job | 15 | Make a Block With Studs |
| R.S.A. | 16 | How to Remove Broken Studs or Screws |
| Job | 16 | Drill Out Broken Studs |
| R.S.A. | 17 | Hand Forging |
| Job | 17 | Make an Adjustment Rod |
| R.S.A. | 18 | Soldering |
| Job | 18 | Make an Oil Pan |
| R.S.A. | 19 | Nonferrous Metals and Alloys |
| Job | 19 | Make an Oil Manifold |
| R.S.A. | 20 | Hand Reamers |
| Job | 20 | Install Bushings and Ream to Fit Shaft |
| R.S.A. | 21 | Producing and Processing Iron |
| Job | 21 | Make U Bolt and Strap |
| R.S.A. | 22 | Making Steel |
| Job | 22 | Make Motor Mount |
| R.S.A. | 23 | Rolling Mill |
| Job | 23 | Make an Eye Bolt |
| R.S.A. | 24 | Identification of Metals |
| Job | 24 | Make End Wrench |
| R.S.A. | 25 | Chisels |
| Job | 25 | Make A Cold Chisel |
| R.S.A. | 26 | Heat Treatment of Steel |
| Job | 26 | Make a Center Punch |
| R.S.A. | 27 | Screwdrivers |
| Job | 27 | Make an Offset Screw Driver<br>Case Harden Wrench, Job 24 |
| R.S.A. | 28 | Chipping |
| Job | 28 | Cam Lock Block |
| R.S.A. | 29 | Babbitting |
| Job | 29 | Babbitt Split Bearings |

## Unit II - Drill Press

| | | |
|---|---|---|
| R.S.A. | 1 | Use of the Drill Press |
| Job | 1 | Make a Spacer |
| R.S.A. | 2 | Work Holding Devices |
| Job | 2 | Guide Post Clamp |
| R.S.A. | 3 | Twist Drills and Drill Sizes |
| Job | 3 | Drill Stand, Letter Size |
| R.S.A. | 4 | Twist Drill--Terminology and Definitions |
| Job | 4 | Drill Stand Fractional Sizes |
| R.S.A. | 5 | Drill Chucks and Sleeves |
| Job | 5 | Drill and Wire Gage |
| Job | 5B | Make a Drill Gauge |
| R.S.A. | 6 | Speeds and Feeds of a Drill Press |
| Job | 6 | Make a "C" Clamp |
| R.S.A. | 7 | Laying Out for Drilling |
| Job | 7 | Drawbar Extension |
| R.S.A. | 8 | Drill Grinding |
| Job | 8 | Machine Strap Clamp |
| R.S.A. | 9 | Other Drill Press Operations |
| Job | 9 | Spacer |
| R.S.A. | 10 | Laying Out and Drilling |
| Job | 10 | Mounting Plates |
| R.S.A. | 11 | Reamers |
| Job | 11 | Make Cross Head Pin and Lock |
| R.S.A. | 12 | Tapers |
| Job | 12 | Drill and Ream For Standard Taper Pins in Two Couplings and Shafts |
| R.S.A. | 13 | Laying Out Work |
| Job | 13 | Baffle Plate |
| R.S.A. | 14 | Boring |
| Job | 14 | Bore Large Hole |
| Job | 15 | Column Base |

## Unit III - Shaper

| | | |
|---|---|---|
| R.S.A. | 1 | Construction of the Shaper |
| Job | 1 | Machine a Block Square |
| R.S.A. | 2 | Operation of the Shaper |
| Job | 2 | Make an Offset Key |
| R.S.A. | 3 | Shaper Cutting Tools |
| Job | 3 | Make Two T-Slot Nuts |
| R.S.A. | 4 | Holding the Work |
| Job | 4 | Make a Chock Wedge |
| R.S.A. | 5 | Cutting Slots and Keyseats |
| Job | 5 | Cut an Open End Keyseat |
| Job | 5A | Cut a Closed End Keyseat |
| Job | 5B | Cut an Internal Keyseat |
| R.S.A. | 6 | Cutting Off |
| Job | 6 | Make Two Drill Press Vise Jaws |

Unit III - Shaper (Continued)

| | | |
|---|---|---|
| R.S.A. | 7 | Speeds and Feeds |
| Job | 7 | Make a Spanner Wrench |
| R.S.A. | 8 | Shaping Horizontal Surfaces |
| Job | 8 | Make a Parallel Bar |
| R.S.A. | 9 | Angular Shaping |
| Job | 9 | Make a Drill Drift |
| R.S.A. | 10 | Vertical Shaping |
| Job | 10 | Make an Angle Plate |
| R.S.A. | 11 | Contour Shaping |
| Job | 11 | Make a Cam |
| R.S.A. | 12 | Shaping a Tongue and Groove |
| Job | 12 | Tongue and Groove Blocks |
| R.S.A. | 13 | Block Squaring |
| Job | 13 | "V" Blocks |
| R.S.A. | 14 | Machining Dovetails |
| Job | 14 | Dovetail Block and Slide |
| R.S.A. | 15 | Hydraulic Shapers |
| Job | 15 | T-Slot Block |
| R.S.A. | 16 | Indexing--Simple and Direct |
| Job | 16 | Make a Spline |
| Job | 16A | Make a Spline Hub |
| R.S.A. | 17 | Gear Tooth Parts |
| Job | 17 | Make a Rack Gear |
| Job | 17A | Make a Gear Rack (Alternate) |
| R.S.A. | 18 | Making a Gear Segment |
| Job | 18 | Make a Gear Segment |
| Job | 18A | Make a Gear Segment (Alternate) |
| R.S.A. | 19 | Making a Drill Press Vise |
| Job | 19 | Make a Drill Press Vise |
| R.S.A. | 20 | Cutting Serrations |
| Job | 20 | Make Two Jaws For Drill Press Vise |

Unit IV - Lathe

| | | |
|---|---|---|
| R.S.A. | 1 | Cutting Tools |
| Job | 1 | Grind Lathe Tool Bits |
| R.S.A. | 2 | Types of Lathes and Identification of Parts |
| Job | 2 | Make 2 Stud Blanks |
| R.S.A. | 3 | Principle of the Lathe - Care and Use of the Lathe |
| Job | 3 | Make 2 Bushing Drive Bars |
| R.S.A. | 4 | Drilling |
| Job | 4 | Caliper Parts and Six Washers |
| R.S.A. | 5 | Description of the Compound Rest |
| Job | 5 | Make a Chucking Center |
| R.S.A. | 6 | Filing and Polishing |
| Job | 6 | Make a Pump Shaft |
| R.S.A. | 7 | Drilling and Reaming |
| Job | 7 | Make a Brass Bushing and Steel Roller |
| R.S.A. | 8 | Knurling |
| Job | 8 | Knurled Shaft |

Unit IV - Lathe (Continued)

| | | |
|---|---|---|
| R.S.A. | 9 | Turning Tapers - Tailstock Offset Method |
| Job | 9 | Make an Arbor |
| R.S.A. | 10 | Turning Angles With the Compound Rest |
| Job | 10 | Make a Wheel |
| R.S.A. | 11 | Cutting V-Threads |
| Job | 11 | Thread Two Studs |
| R.S.A. | 12 | Screw Threads |
| Job | 12 | Thread 2 Shafts |
| R.S.A. | 13 | Taper Turning - Taper Attachment - Compound Rest Methods |
| Job | 13 | Hoist Traverse Truck Roller Shaft |
| R.S.A. | 14 | Tapping |
| Job | 14 | Make Shift Rod Spool |
| R.S.A. | 15 | Boring |
| Job | 15 | Make Drive Shaft Bushing Housing |
| R.S.A. | 16 | Interchangeable Manufacture - Mass Production - Fits and Tolerances |
| Job | 16 | Make a Drive Shaft Bushing |
| R.S.A. | 17 | Taper Boring |
| Job | 17 | Make Hoist Traverse Truck Roller and Thrust Washer |
| R.S.A. | 18 | Internal Threading |
| Job | 18 | Pipe Puller and Nut |
| R.S.A. | 19 | Cutting a Left Hand Thread |
| Job | 19 | Pipe Puller Screw and Nut |
| R.S.A. | 20 | Counterboring--Threading to a Shoulder |
| Job | 20 | Make Piston Rod Connecting Spool |
| R.S.A. | 21 | Acme Screw Thread |
| Job | 21 | External and Internal Acme Thread |
| R.S.A. | 22 | Square Threads |
| Job | 22 | Cutting a Square Thread |
| R.S.A. | 23 | Acme Threading, Single and Multiple |
| Job | 23 | Double Lead Acme Thread Left-Hand |
| R.S.A. | 24 | Dial Indicator Method |
| Job | 24 | Live Center |
| R.S.A. | 25 | Pipe Threads |
| Job | 25 | Cut and Fit External and Internal Pipe Threads |
| R.S.A. | 26 | Social Security Act |
| Job | 26 | Tap Handle |
| R.S.A. | 27 | Radius Tools |
| Job | 27 | Machinist Hammer Kit |
| Job | 28 | Milling Machine Jack |
| R.S.A. | 29 | Sheaves |
| Job | 29 | Emery-Wheel Stand |
| R.S.A. | 30 | Faceplate Work, Angle-Plate |
| Job | 30 | Machine Cast Elbow |
| R.S.A. | 31 | Steady Rest and Follow Rest |
| Job | 31 | Turn a Long Shaft |
| R.S.A. | 32 | Turning a Crankshaft or an Eccentric |

## Unit IV - Lathe (Continued)

| | | |
|---|---|---|
| Job | 32 | Turn an Eccentric |
| Job | 33 | Box and Pin |
| Job | 34 | Tap Wrench |
| Job | 35 | Marine Propeller Shaft |

## Unit V - Milling Machine

| | | |
|---|---|---|
| R.S.A. | 1 | The Milling Machine |
| Job | 1 | To Oil the Milling Machine |
| R.S.A. | 2 | Operation of the Milling Machine |
| Job | 2 | Machine a Steel Block |
| R.S.A. | 3 | Milling Cutters |
| Job | 3 | Make 2 Mild Steel Brackets |
| R.S.A. | 4 | Mounting the Milling Cutter |
| Job | 4 | Machine a Cast Iron Bracket |
| R.S.A. | 5 | Work Holding Devices |
| Job | 5 | Machine a Spacer |
| R.S.A. | 6 | Speeds and Feeds |
| Job | 6 | Cut Keyways on a Shaft |
| R.S.A. | 7 | Slotting and Sawing |
| Job | 7 | Adjustable Parallel Bar |
| R.S.A. | 8 | End Mills and Woodruff Keyseat Cutters |
| Job | 8 | Keyslot Cut With End Mill |
| R.S.A. | 9 | Coolants and Their Uses |
| Job | 9 | Cut a Woodruff Keyseat |
| R.S.A. | 10 | Straddle Milling |
| Job | 10 | Make a Nut |
| R.S.A. | 11 | Climb Milling |
| Job | 11 | Make and Graduate a Keyseat Rule |
| R.S.A. | 12 | Special Attachments |
| Job | 12 | Gear Case Cover |
| R.S.A. | 13 | Fixtures |
| Job | 13 | Fixture For Slotting Screws |
| R.S.A. | 14 | The Index Head |
| Job | 14 | Steel Index Pin |
| R.S.A. | 15 | Using the Index Head |
| Job | 15 | Graduate a Machine Tool Feed Dial--125 Divisions |
| R.S.A. | 16 | Spur Gearing |
| Job | 16 | Machine a Pair of Spur Gears |
| R.S.A. | 17 | Spline Cutting and Fly Cutters |
| Job | 17 | Cut a Spline Shaft (A. Using 2 Cutters)<br>(B. Using Fly Cutters) |
| R.S.A. | 18 | Clutches and Couplings |
| Job | 18 | Machine a Straight-Toothed Clutch |
| Job | 19 | Machine Saw-Toothed Clutch |
| R.S.A. | 20 | Bevel Gears |
| Job | 20 | Bevel Gears Right Angle Shafts |
| R.S.A. | 21 | Cam Milling |
| Job | 21 | Mill a Cam |

Unit V - Milling Machine

| | | |
|---|---|---|
| R.S.A. | 22 | Helical or Spiral Milling |
| Job | 22 | Steel Pull Pin |
| R.S.A. | 23 | Spiral Milling |
| Job | 23 | Spiral Milling Cutter |
| R.S.A. | 24 | Spiral Gear |
| Job | 24 | Spiral Gear |
| Supplementary Jobs | | |
| Sup. Job | 25 | Make a Tap |
| Sup. Job | 26 | Machine a Reamer |
| Sup. Job | 27 | Make a Worm and Worm Gear |
| Sup. Job | 28 | Make a Step Block |

The Accounting Course was written in 1955, revised in 1958 and again in 1963. It is available in book form. This material consists of 60 jobs.

The reference for this Course is listed below:

| Title | Source |
|---|---|
| Sherwood, Boling, Carson,<br>COLLEGE ACCOUNTING<br>7th Edition, 1962 | South-Western Publishing Co.,<br>5101 Madison Road<br>Cincinnati 27, Ohio |

A detailed outline of the Accounting Course follows:

Unit One, ELEMENTS OF ACCOUNTING
Report One, ASSETS, LIABILITIES, AND PROPRIETORSHIP

Job No. 1 - Perform Practical Problems Involving Accounting Equation

Unit One, ELEMENTS OF ACCOUNTING
Report Two, THE DOUBLE ENTRY PROCESS

Job No. 2 - Record Transactions in "T" Accounts; Take Balance of Accounts; Prepare Trial Balance.

Unit Two, ACCOUNTING PROCEDURE
Report Three, JOURNALIZING TRANSACTIONS

Job No. 3 - Analyze Transactions; Make General Journal Entries

Unit Two, ACCOUNTING PROCEDURE
Report Four, POSTING AND THE TRIAL BALANCE

Job No. 4 - Make Journal Entries; Post Entries; Take Trial Balance.

Unit Two, ACCOUNTING PROCEDURE
Report Five, THE FINANCIAL STATEMENTS

Job No. 5 - Prepare Income Statement; Prepare Balance Sheet.

Unit Three, ACCOUNTING FOR MERCHANDISE
Report Six, PURCHASES AND THE PURCHASES JOURNAL

Job No. 6 - Make Journal Entries of Transactions Stressing Purchases Journal; Posting to Ledger and Taking Trial Balance

Course Outline (Continued)

Unit Three, ACCOUNTING FOR MERCHANDISE
Report Seven, SALES AND THE SALES JOURNAL

Job No. 7 - Make Journal Entries of Transactions Stressing Sales Journal; Posting to Ledger and Taking Trial Balance

Unit Three, ACCOUNTING FOR MERCHANDISE
Report Eight, ACCOUNTING PROCEDURE

Job No. 8 - Make Journal Entries Using the General Journal, Purchases Journal, and Sales Journal, Posting to Ledger and Taking Trial Balance.

Unit Four, ACCOUNTING FOR CASH
Report Nine, RECORD OF CASH RECEIPTS AND DISBURSEMENTS: PETTY CASH

Job No. 9 - Record Transactions in the Cashbook, the Combined Cash-Journal, Petty Cash Disbursements Record, and Other Special Journals: Prove, Post, and Take a Trial Balance.

Unit Four, ACCOUNTING FOR CASH
Report Ten, BANKING PROCEDURE

Job No. 10 - Perform Operations in Transactions Affecting Banking; Reconcile Bank Balance; Record Transactions in the Combined Cash-Journal and Other Special Journals: Post and Take a Trial Balance.

Unit Five, PAYROLL ACCOUNTING
Report Eleven, EARNINGS AND DEDUCTIONS

Job No. 11 - Complete Payroll Records; Compute Employee Wages and Deductions.

Unit Five, PAYROLL ACCOUNTING
Report Twelve, PAYROLL TAXES IMPOSED ON THE EMPLOYER

Job No. 12 - Journalize Transactions Concerning the Accounting for Payrolls and Payroll Deductions; Post and Enter Account Balances.

Unit Six, ACCOUNTING FOR A RETAIL STORE
Report Thirteen, PRINCIPLES AND PROCEDURES

Job No. 13 - Classify Accounts and Analyze Procedures Relating to Retail Accounting; Journalize Transactions.

Course Outline (Continued)

Unit Six, ACCOUNTING FOR A RETAIL STORE
Report Fourteen, APPLICATION OF ACCOUNTING PRINCIPLES

Job No. 14 - Answering Questions Taken From the Books of a Retail Merchant

Unit Seven, THE PERIODIC SUMMARY
Report Fifteen, END-OF-PERIOD WORK SHEET

Job No. 15 - Complete a Work Sheet for a Mercantile Enterprise

Unit Seven, THE PERIODIC SUMMARY
Report Sixteen, THE FINANCIAL STATEMENTS

Job No. 16 - Check Work Sheet Procedures; Prepare an Income Statement and Balance Sheet; Compute Ratios

Unit Eight, ADJUSTING AND CLOSING ACCOUNTS AT END OF ACCOUNTING PERIOD
Report Seventeen, ADJUSTING ENTRIES

Job No. 17 - Made Adjusting Entries in Journal Form; Post and Prepare Cost of Goods Sold Schedule

Unit Eight, ADJUSTING AND CLOSING ACCOUNTS AT END OF ACCOUNTING PERIOD
Report Eighteen, CLOSING PROCEDURE

Job No. 18 - Draft Entries to Close Temporary Proprietorship Accounts; Post and Rule Accounts in Balance; Take Post-Closing Trial Balance; Draft Reversing Entries and Post

Unit Nine, ACCOUNTING FOR INVESTMENTS
Report Nineteen, ACCOUNTING PROCEDURE

Job No. 19 - Journalize Transactions Dealing with Investments; Post Entries; Close Temporary Accounts

Unit Ten, THE PERSONAL SERVICE ENTERPRISE
Report Twenty, ACCOUNTING METHODS

Job No. 20 - Journalizing Transactions Dealing with Personal Service Enterprises; Complete Work Sheet; Draft Adjusting and Closing Entries; Prepare Financial Statements

Course Outline (Continued)

Unit Eleven, ACCOUNTING FOR OWNERS' EQUITY
Report Twenty-One, THE SOLE PROPRIETORSHIP

Job No. 21 - Make Opening Entries, and Record Necessary Changes at End of Accounting Period

Unit Eleven, ACCOUNTING FOR OWNERS' EQUITY
Report Twenty-Three, THE CORPORATION

Job No. 23 - Answer Questions and Record Transactions Regarding Corporations

Unit Twelve, ACCOUNTING FOR NOTES AND DRAFTS
Report Twenty-Four, NOTES

Job No. 24 - Draft Entries Concerning Notes; Record Entries in Notes Receivable and Notes Payable Registers

Unit Twelve, ACCOUNTING FOR NOTES AND DRAFTS
Report Twenty-Five, DRAFTS AND TRADE ACCEPTANCES

Job No. 25 - Draft Entries Regarding Drafts and Trade Acceptances; Complete Partial Posting

Unit Thirteen, ACCOUNTING FOR PURCHASES
Report Twenty-Six, PURCHASING PROCEDURE

Job No. 26 - Complete Statements and Fill in Forms That are Used in the Purchasing Procedure

Unit Thirteen, ACCOUNTING FOR PURCHASES
Report Twenty-Seven, ACCOUNTING PRACTICE

Job No. 27 - Verify Invoices; Enter Invoices in Invoice Record; Complete Individual and Summary Posting; Prepare Schedule of Accounts Payable.

Unit Fourteen, ACCOUNTING FOR SALES
Report Twenty-Eight, CASH SALES AND CREDIT SALES

Job No. 28 - Complete Statements; Prepare Sales Invoices; Enter Sales in Sales Record; Complete Individual and Summary Posting; Prepare Schedule of Accounts Receivable

Course Outline (Continued)

Unit Fifteen, INSTALLMENT SALES AND CONSIGNMENT SALES
Report Twenty-Nine, INSTALLMENT SALES

Job No. 29 - Answer Questions and Work Problems Concerning Installment Sales

Unit Fifteen, INSTALLMENT SALES AND CONSIGNMENT SALES
Report Thirty, CONSIGNMENT SALES

Job No. 30 - Answer Questions and Draft Entries Concerning Consignment Sales

Unit Sixteen, ACCOUNTING FOR INVENTORY AND PREPAID EXPENSES
Report Thirty-One, MERCHANDISE INVENTORY

Job No. 31 - Analyze Merchandise Accounting Procedures; Complete Inventory Extensions; Prepare Revised Income Statement

Unit Sixteen, ACCOUNTING FOR INVENTORY AND PREPAID EXPENSES
Report Thirty-Two, PREPAID EXPENSES

Job No. 32 - Analyze Transactions and Work Problems Concerning Prepaid Expenses

Unit Seventeen, ACCOUNTING FOR TANGIBLE FIXED ASSETS
Report Thirty-Three, LAND, BUILDINGS, AND EQUIPMENT

Job No. 33 - Answer Questions and Work Problems Concerning Depreciation of Fixed Assets

Unit Seventeen, ACCOUNTING FOR TANGIBLE FIXED ASSETS
Report Thirty-Four, ACCOUNTING PROCEDURE

Job No. 34 - Record the Purchasing, Depreciation, and Disposition of Fixed Assets

Unit Eighteen, ACCOUNTING FOR A WHOLESALE BUSINESS
Report Thirty-Five, APPLICATION OF ACCOUNTING PRINCIPLES

Job No. 35 - Complete Analysis Test Based on Books of Account in Reference

Unit Nineteen, ACCOUNTING PROCEDURE AT END OF MONTH
Report Thirty-Six, MONTHLY ADJUSTMENT OF THE OPERATING EXPENSE ACCOUNTS

Job No. 36 - Draft Adjusting Entries; Complete Posting Procedures; Prepare Schedule of Operating Expenses

Course Outline (Continued)

Unit Nineteen, ACCOUNTING PROCEDURE AT END OF MONTH
Report Thirty-Seven, END-OF-PERIOD WORK SHEET

Job No. 37 - Prepare Work Sheets

Unit Twenty, MONTHLY FINANCIAL STATEMENTS AND PROCEDURE AT END OF YEAR
Report Thirty-Eight, THE INCOME STATEMENT

Job No. 38 - Prepare Income Statement, Schedule of Cost of Goods Sold, and Percentage Analysis

Unit Twenty, MONTHLY FINANCIAL STATEMENTS AND PROCEDURE AT END OF YEAR
Report Thirty-Nine, THE BALANCE SHEET

Job No. 39 - Prepare Balance Sheet; Compute Ratio Analysis

Unit Twenty, MONTHLY FINANCIAL STATEMENTS AND PROCEDURE AT END OF YEAR
Report Forty, PROCEDURE AT END OF YEAR

Job No. 40 - Prepare Work Sheet, Income Statement, Balance Sheet, and Schedule of Cost of Goods Sold; Draft and Post Adjusting and Closing Entries; Rule Accounts and Take Post-Closing Trial Balance

Unit Twenty-One, THE CORPORATE ORGANIZATION
Report Forty-One, ORGANIZATION AND MANAGEMENT

Job No. 41 - Analyze Statements and Answer Questions Concerning the Corporate Organization and the Certificate of Incorporation

Unit Twenty-One, THE CORPORATE ORGANIZATION
Report Forty-Two, CORPORATE RECORDS

Job No. 42 - Answer Questions and Make Entries in Stock Records

Unit Twenty-Two, ACCOUNTING FOR CAPITAL STOCK
Report Forty-Three, TYPES AND VALUES OF CAPITAL STOCK

Job No. 43 - Analyze Statements and Work Problems Concerning Capital Stock

Course Outline (Continued)

Unit Twenty-Two, ACCOUNTING FOR CAPITAL STOCK
Report Forty-Four, RECORDING CAPITAL STOCK TRANSACTIONS

Job No. 44 - Analyze Corporate Accounts and Stock Transactions; Record Capital Stock Transactions in Journal Form; Post; Take Trial Balance.

Unit Twenty-Three, ACCOUNTING FOR CORPORATION EARNINGS
Report Forty-Five, EARNINGS RETAINED IN THE BUSINESS

Job No. 45 - Analyze Statements and Journalize Transactions Concerning Corporation Earnings; Prepare Statement of Retained Earnings.

Unit Twenty-Three, ACCOUNTING FOR CORPORATION EARNINGS
Report Forty-Six, EARNINGS DISTRIBUTED TO STOCKHOLDERS

Job No. 46 - Analyze Statements and Record Transactions in Journal Form Concerning the Distribution of Corporate Earnings

Unit Twenty-Four, ACCOUNTING FOR CORPORATION BONDS
Report Forty-Seven, ACCOUNTING FOR BONDS SOLD

Job No. 47 - Answer Questions and Journalize Transactions Concerning Bond Sales and Bond Interest

Unit Twenty-Four, ACCOUNTING FOR CORPORATION BONDS
Report Forty-Eight, ACCOUNTING FOR BOND INTEREST EXPENSE AND FOR BONDS RETIRED

Job No. 48 - Answer Questions and Draft Entries Concerning Bond Interest, Amortization, and Sinking Fund

Unit Twenty-Five, ACCOUNTING FOR INTANGIBLE AND WASTING ASSETS
Report Forty-Nine, ACCOUNTING PROCEDURE

Job No. 49 - Answer Questions and Draft Adjusting Entries Concerning Intangible and Wasting Assets; Prepare Schedule of Intangible Assets

Unit Twenty-Six, THE VOUCHER SYSTEM OF ACCOUNTING
Report Fifty, PRINCIPLES OF VOUCHER ACCOUNTING

Job No. 50 - Prepare Vouchers; Record Voucher Register; Record Payment of Vouchers

Course Outline (Continued)

Unit Twenty-Seven, ACCOUNTING FOR A MANUFACTURING BUSINESS
Report Fifty-One, MANUFACTURING COST; INVENTORIES OF A MANUFACTURING BUSINESS

Job No. 51 - Answer Questions and Work Problems Concerning Manufacturing Cost

Unit Twenty-Seven, ACCOUNTING FOR A MANUFACTURING BUSINESS
Report Fifty-Two, THE CHART OF ACCOUNTS AND RECORDS OF A MANUFACTURING BUSINESS

Job No. 52 - Answer Questions and Number Accounts Based on Chart of Accounts in Reference

Unit Twenty-Eight, ACCOUNTING FOR A MANUFACTURING BUSINESS (CONCLUDED)
Report Fifty-Three, THE WORK SHEET OF A MANUFACTURING BUSINESS

Job No. 53 - Prepare a Work Sheet for a Manufacturing Enterprise

Unit Twenty-Eight, ACCOUNTING FOR A MANUFACTURING BUSINESS (CONCLUDED)
Report Fifty-Four, THE ANNUAL REPORT OF A MANUFACTURING BUSINESS

Job No. 54 - Prepare and Analyze Financial Statements

Unit Twenty-Eight, ACCOUNTING FOR A MANUFACTURING BUSINESS (CONCLUDED)
Report Fifty-Five, CLOSING THE BOOKS OF A MANUFACTURING BUSINESS

Job No. 55 - Draft and Post Adjusting, Closing, and Reversing Entries; Take Post-Closing Trial Balance

Unit Twenty-Nine, ACCOUNTING FOR BRANCH OPERATION
Report Fifty-Six, RECIPROCAL ACCOUNTS AND RECORDING PROCEDURE

Job No. 56 - Analyze Transactions; Journalize Transactions, Post, and Take Trial Balance for the Home Office and the Branch

Unit Twenty-Nine, ACCOUNTING FOR BRANCH OPERATIONS
Report Fifty-Seven, PROCEDURE AT CLOSE OF FISCAL YEAR

Job No. 57 - Analyze Statements; Complete the Work at the End of the Accounting Period for Both the Home Office and the Branch

Course Outline (Continued)

Unit Twenty-Nine, ACCOUNTING FOR BRANCH OPERATIONS
Report Fifty-Eight, COMBINED FINANCIAL STATEMENTS OF HOME OFFICE AND BRANCH

Job No. 58 - Prepare Combined Income Statement and Balance Sheet; Complete Analysis Test

Unit Thirty, ANALYSIS OF FINANCIAL STATEMENTS
Report Fifty-Nine, COMPARATIVE ANALYSIS: RATIOS

Job No. 59 - Comparative Analysis of the Financial Statements; Compute Ratios

Unit Thirty, ANALYSIS OF FINANCIAL STATEMENTS
Report Sixty, THE STATEMENT OF SOURCE AND APPLICATION OF FUNDS

Job No. 60 - Complete Work Sheet; Prepare a Statement of Source and Application of Funds, A Schedule of Current Assets and Current Liabilities

The Business English Course was written in 1961 and revised in 1964. It is available in bound form and consists of 34 jobs.

The reference for the Business English Course is listed below:

| Title | Source |
|---|---|
| Aurner, Robert R.<br>PRACTICAL BUSINESS ENGLISH FOR COLLEGES, Third Edition, 1960 | South-Western Publishing Co.<br>221 Pacific Avenue<br>Dallas 2, Texas |

A detailed outline of the Business English Course follows:

Job No. 1: Parts of Speech

Job No. 2: Participles

Job No. 3: Infinitives

Job No. 4: Case of Nouns and Pronouns

Job No. 5: Relative and Interrogative Pronouns

Job No. 6: Forming Plurals of Nouns and Pronouns

Job No. 7: Forming the Singular Possessive and the Plural Possessive of Nouns and Pronouns

Job No. 8: Agreement of the Pronoun and Its Antecedent

Job No. 9: Agreement of the Pronoun and Its Antecedent (Cont'd)

Job No. 10: Verb Tenses

Job No. 11: Treacherous Verbs

Job No. 12: Agreement of Verb with Subject

Job No. 13: Agreement of Verb with Collective and Compound Subjects

Job No. 14: Contractions

Job No. 15: Adjectives

Job No. 16: Adverbs

## Course Outline (Continued)

Job No. 17: Distinguishing Adverbs from Adjectives

Job No. 18: Prepositions

Job No. 19: Conjunctions

Job No. 20: Parallel Structure

Job No. 21: The Sentence

Job No. 22: Simple, Compound, and Complex Sentences

Job No. 23: Misused Words and Phrases

Job No. 24: The Period

Job No. 25: The Comma

Job No. 26: The Comma (Cont'd)

Job No. 27: The Semicolon

Job No. 28: The Semicolon (Cont'd)

Job No. 29: Capitalization

Job No. 30: Capitalization (Cont'd)

Job No. 31: Order of and Spacing after Punctuation Marks

Job No. 32: Expression of Numbers

Job No. 33: Expression of Numbers (Cont'd)

Job No. 34: Abbreviations

The Business Law Course was written in 1955 and revised in 1961. It is available in bound form. This material consists of 54 jobs.

The references for the Business Law Course are listed below:

| Title | Source |
|---|---|
| Fisk and Snapp<br>APPLIED BUSINESS LAW<br>8th Edition, 1960 | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |
| LEGAL SECRETARY HANDBOOK<br>(Louisiana) | Shreveport Legal Secretaries<br>Association<br>Shreveport, Louisiana |

A detailed outline of the Business Law Course follows:

Job 1

Law and Legal Problems

Job 2

Law and Legal Problems

Job 3

Law and Legal Problems

Job 4

Contracts

Job 5

Contracts

Job 6

Contracts

Job 7

Contracts

Job 8

Review and Test

Course Outline (Continued)

Job 9

Contracts

Job 10

Contracts

Job 11

Contracts

Job 12

Contracts

Job 13

Contracts

Job 14

Contracts

Job 15

Review and Test

Job 16

Bailments

Job 17

Bailments

Job 18

Bailments

Job 19

Buyer and Seller

Job 20

Buyer and Seller

Course Outline (Continued)

Job 21

Buyer and Seller

Job 22

Contracts

Job 23

Buyer and Seller

Job 24

Buyer and Seller

Job 25

Review and Test

Job 26

Debtors and Creditors

Job 27

Debtors and Creditors

Job 28

Negotiable Instruments

Job 29

Negotiable Instruments

Job 30

Negotiable Instruments

Job 31

Negotiable Instruments

Job 32

Negotiable Instruments

Course Outline (Continued)

Job 33

Negotiable Instruments

Job 34

Review and Test

Job 35

Employer and Employee

Job 36

Employer and Employee

Job 37

Employer and Employee

Job 38

Employer and Employee

Job 39

Principal and Agent

Job 40

Principal and Agent

Job 41

Review and Test

Job 42

Insurance

Job 43

Insurance

Job 44

Insurance

Course Outline (Continued)

Job 45

Motor Vehicles

Job 46

Motor Vehicles

Job 47

Review and Test

Job 48

Property

Job 49

Property

Job 50

Property

Job 51

Property

Job 52

Business Organization

Job 53

Business Organization

Job 54

Review and Test

The Business Letter Writing Course was written in 1962 and revised in 1967. A Student Handbook and an Instructor's Guide are available in book form.

The references for the Business Letter Writing Course are the following:

| Title | Source |
|---|---|
| Aurner, Robert R.<br>EFFECTIVE COMMUNICATION IN BUSINESS, Fourth Edition | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |
| Gavin and Hutchinson<br>REFERENCE MANUAL FOR STENOGRAPHERS AND TYPISTS<br>Third Edition | Gregg Division<br>McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Gove, Philip B. (Editor-in-Chief)<br>WEBSTER'S SEVENTH NEW COLLEGIATE DICTIONARY, Seventh Edition | G & C Merriam Company<br>Springfield, Massachusetts |
| Larson, Lena and A. Koebele<br>REFERENCE MANUAL FOR OFFICE EMPLOYEES, Fourth Edition | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |
| Payne, Lucile Vaughan<br>THE LIVELY ART OF WRITING | Follett Publishing Company<br>1010 West Washington Blvd.<br>Chicago 7, Illinois |
| Robertson, Mary and Charles F. Walker<br>PRACTICAL BUSINESS CORRESPONDENCE FOR COLLEGES<br>Third Edition | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |
| Wilkinson, Menning and Anderson<br>WRITING FOR BUSINESS,<br>Third Edition | Richard D. Irwin, Inc.<br>Homewood, Illinois |

A detailed outline of the Business Letter Writing Course follows:

UNIT 1 - Capturing Attention Through Business Letter Styling

UNIT 2 - Five Tests of an Effective Letter

Course Outline (Continued)

UNIT 3 - Human Relations in Effective Letters

UNIT 4 - Letters that Ask, Reply, Order, Acknowledge or Remit

UNIT 5 - Letters that Invite, Announce, or Express Appreciation or Sympathy

UNIT 6 - Letters that Introduce, Inquire About, or Recommend Individuals

UNIT 7 - Letters that Secure Employment

UNIT 8 - Letters that Sell

UNIT 9 - Letters that Present Claims and Handle Adjustments

UNIT 10 - Letters that Involve Credit and Collections

UNIT 11 - Letters that Build Reports

UNIT 12 - Special Forms of Communication

UNIT 13 - Dictating Business Letters

UNIT 14 - Letter-Writing Projects

The Business Mathematics Course was revised in 1961. It is available in bound form. This material consists of 32 jobs.

The reference for the Business Mathematics Course is listed below:

| Title | Source |
|---|---|
| Rice, Boyd, and Mayne, BUSINESS MATHEMATICS FOR COLLEGES, Fourth Edition, 1961 | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |

A detailed outline of the Business Mathematics Course follows:

Job 1 - Inventory Test

Job 2 - Addition and Subtraction

Job 3 - Check Records

Job 4 - Multiplication Inventory

Job 5 - Division: Averages and Turnover

Job 6 - Weights and Measures

Job 7 - Addition and Subtraction of Decimals

Job 8 - Multiplication and Division of Decimals

Job 9 - Addition and Subtraction of Fractions

Job 10 - Multiplication and Division of Fractions

Job 11 - Aliquot Parts, Sales Tickets and Invoices, and Repair Orders

Job 12 - Percentage, Base, and Rate

Job 13 - Cash and Trade Discounts

Job 14 - Commissions, Sales, and Purchases

Job 15 - Statement of Profit and Loss: Mark-up

Job 16 - Depreciation and Overhead

Course Outline (Cont'd)

Job 17 - Simple Interest

Job 18 - Promissory Notes and Interest

Job 19 - Interest Tables: Other Interest Formulas

Job 20 - Bank Discount

Job 21 - Interest on Unpaid Balances

Job 22 - Compound Interest and Present Value

Job 23 - Annuities, Sinking Funds, and Amortization

Job 24 - Fire, Casualty, and Life Insurance

Job 25 - Payroll Sheet, Change Tally, and Change Slip

Job 26 - Payroll Deductions

Job 27 - Sales and Property Taxes

Job 28 - Federal Income Tax

Job 29 - Income Statement Analysis

Job 30 - Balance Sheet Analysis

Job 31 - Statistics and Graphs

Job 32 - Stocks and Bonds and Policies

OFFICE OCCUPATIONS
BUSINESS STRUCTURE, ORGANIZATION
AND MANAGEMENT
Trade Preparatory

The Business Structure, Organization and Management Course was written in 1955 and revised in 1963. It is available in bound form. This material consists of 32 jobs.

The reference for the Business Structure, Oraganization and Management Course is listed below:

| Title | Source |
|---|---|
| Raymond E. Glos and Harold A. Baker<br>INTRODUCTION TO BUSINESS<br>5th Edition (4th Ed. available) | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |

A detailed outline of the Business Structure, Organization and Management Course follows:

Unit 1 - Business--Its Nature, Environment, and Opportunities

Job 1 The Nature of American Business
Job 2 Business and Its Environment
Job 3 Careers in Business

Unit 2 - Ownership, Management, and Organization

Job 4 Sole Proprietorships and Partnerships
Job 5 Corporations
Job 6 Management and Organization

Unit 3 - Marketing

Job 7 The Nature and Scope of Marketing
Job 8 Retailing and Retailers
Job 9 Wholesaling and Wholesalers
Job 10 Prices and Pricing
Job 11 Advertising Problems
Job 12 International Trade

Unit 4 - Physical Factors

Job 13 Location and Layout
Job 14 Purchasing and Inventory Control
Job 15 Production Problems

Unit 5 - Personnel

Job 16 Employee Selection and Training
Job 17 Employee Compensation
Job 18 Labor Problems and Legislation

Course Outline (Continued)

Unit 6 - Finance

Job 19 Long-Term Finance
Job 20 Short-Term Finance
Job 21 Financial Institutions
Job 22 Security Exchanges and Financial News
Job 23 Risks and Insurance
Job 24 Financial Problems and Policies

Unit 7 - Quantitative Controls for Decision Making

Job 25 Accounting and Financial Statements
Job 26 Business Statistics
Job 27 Budgets and Forecasting

Unit 8 - Legal and Regulatory Environment of Business

Job 28 Ethics and Business Law
Job 29 Regulation of Competitive Business
Job 30 Regulated Industries
Job 31 Taxation and Business

The Filing Course was revised in 1961 and again in 1963. It is available in bound form. This material consists of 23 Jobs.

The reference for the Filing Course is listed below:

| Title | Source |
|---|---|
| Kahn, Yerian and Stewart<br>PROGRESSIVE FILING<br>1961 | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |

A detailed outline of the Filing Course follows:

Job 1 Indexing Rules, Alphabetic Card Filing

Job 2 Indexing Rules, Alphabetic Card Filing

Job 3 Indexing Rules, Alphabetic Card Filing

Job 4 Indexing Rules, Alphabetic Card Filing

Job 5 Indexing Rules, Alphabetic Card Filing

Job 6 Indexing Rules, Alphabetic Card Filing

Job 7 Filing Procedures and Materials

Job 8 Alphabetic Correspondence Filing

Job 9 Alphabetic Correspondence Filing

Job 10 Charge Methods, Transfer Methods

Job 11 Selection of Equipment and Supplies

Job 12 Numeric Correspondence Filing

Job 13 Numeric Correspondence Filing

Job 14 Geographic Correspondence Filing

Job 15 Geographic Correspondence Filing

Job 16 Subject Correspondence Filing

Job 17 Subject Correspondence Filing

Job 18 Card Filing--Vertical and Visible; Decimal--Subject Co-respondence Filing

Course Outline (Cont'd)

Job 19 Decimal--Subject Correspondence Filing

Job 20 Soundex Coding System, Triple-Check Automatic Index

Job 21 Cards and Visible Records

Job 22 Establishing and Maintaining Filing Systems

Job 13 Final Test

The Full-Keyboard Adding Listing Machine Course was written in 1955 and revised in 1963. It is available in bound form. The material covers 20 jobs.

The reference for the Full-Keyboard Adding-Listing Machine Course is listed below.

| Title | Source |
|---|---|
| Agnew and Pasewark<br>FULL-KEYBOARD ADDING-LISTING MACHINE COURSE, Third Edition | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |

A detailed outline of the Full-Keyboard Adding-Listing Machine Course follows:

Job 1 ADDITION - Zeros; One- and Two-Digit Numbers

Job 2 ADDITION - Three-Digit Numbers

Job 3 ADDITION - Four-, Five-, and Six-Digit Numbers; Non-Add Key

Job 4 SUBTRACTION AND CORRECTION OF ERRORS

Job 5 SPEED DRILL-ADDITION

Job 6 REPEAT ADDITION

Job 7 MULTIPLICATION

Job 8 SUBTOTAL AND CROSSFOOTING

Job 9 SPEED DRILL - ADDITION

Job 10 TEST NO. 1

Job 11 PERCENTAGES, DECIMALS, AND FRACTIONS

Job 12 FIXED DECIMAL POINT

Job 13 MULTIPLICATION, Short Cut Method

Job 14 DISCOUNT AND NET AMOUNT

Job 15 SPEED DRILL - ADDITION

Job 16 DIVISION - Decimals in Dividend and Divisor

Job 17 CREDIT BALANCES

Course Outline (Continued)

Job 18 BUSINESS FORMS

Job 19 SPEED DRILL - ADDITION

Job 20 TEST NO. 2

The Key-Driven Calculator material was written in 1955 and revised in 1963. It is available in bound form. This material consists of 60 jobs.

The reference for the Key-Driven Calculator Course is listed below:

| Title | Source |
|---|---|
| Agnew and Pasewark<br>KEY-DRIVEN CALCULATOR COURSE<br>4th Edition | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |

A detailed outline of the Key-Driven Calculator Course follows:

Part 1

Job 1 - TOUCH ADDITION - Two Digit Numbers 1-5; One-Key Ascent and Descent

Job 2 - TOUCH ADDITION - Two-Key Ascent and Descent; Decimals

Job 3 - TOUCH ADDITION - Numbers 6-9

Job 4 - TOUCH ADDITION - Three-Digit Numbers; Zeros

Job 5 - MULTIPLICATION - One- and Two-Digit Factors; Decimals

Job 6 - TOUCH ADDITION - Three-Key Ascent and Descent

Job 7 - SUBTRACTION

Job 8 - TOUCH ADDITION - Four-Key Ascent and Descent

Job 9 - DIVISION - Trial-Divisor Method

Job 10 - TEST NUMBER ONE

Part 2

Job 11 - MULTIPLICATION - Natural Fingering; Three- and Four-Digit Multiplicands

Job 12 - MULTIPLICATION - Reverse and Cross Hand Fingering

Job 13 - SPEED DRILL - Three-Column Addition

Course Outline (Continued)

Job 14 - TOUCH ADDITION - Four-Digit Numbers

Job 15 - MULTIPLICATION - Interposed Fingering; Zeros

Job 16 - SUBTRACTION - Zeros and Nines; Fewer Digits in Subtrahend

Job 17 - SPEED DRILL - Four-Column Addition

Job 18 - CROSSFOOTING

Job 19 - DIVISION - Decimals in Quotient; Decimals in Dividend and Divisor; Nines in Divisor

Job 20 - TEST NUMBER TWO

Part 3

Job 21 - MULTIPLICATION - Fractions

Job 22 - MULTIPLICATION - Accumulation of Products

Job 23 - SPEED DRILL - Multiplication of Four-Digit Multiplicands

Job 24 - MULTIPLICATION - Fixed Decimal

Job 25 - MULTIPLICATION - Left-to-Right, Using a Fixed Decimal

Job 26 - TOUCH ADDITION - Five-Digit Numbers

Job 27 - SPEED DRILL - Five-Column Addition

Job 28 - INVENTORIES - Pricing by C, M, and CWT

Job 29 - Compound Multiplication

Job 30 - Test Number Three

Part 4

Job 31 - MULTIPLICATION - Left-to-Right, Dropping off the Keyboard

Job 32 - MULTIPLICATION - Splitting the Key Factor

Job 33 - SPEED DRILL - Four-Column Addition

Course Outline (Continued)

Job 34 - PERCENTAGE

Job 35 - PERCENTAGE OF INCREASE AND DECREASE

Job 36 - TOUCH ADDITION - Six-Digit Numbers

Job 37 - SPEED DRILL - Five-Column Addition

Job 38 - DISCOUNTS

Job 39 - CHAIN DISCOUNTS

Job 40 - TEST NUMBER FOUR

Part 5

Job 41 - INVENTORIES

Job 42 - INVENTORIES - Turnover and Unit Cost

Job 43 - SPEED DRILL - Multiplication of Four-Digit Factors with Decimals

Job 44 - SALES DISTRIBUTION AND REPORTS

Job 45 - LEDGER SHEETS

Job 46 - TOUCH ADDITION - Seven-Digit Numbers

Job 47 - SPEED DRILL - Four-Column Addition Handwritten

Job 48 - CREDIT BALANCES

Job 49 - DIVISION - Reciprocal Method

Job 50 - TEST NUMBER FIVE

Part 6

Job 51 - PRORATING

Job 52 - RECONCILIATION OF BANK STATEMENTS

Job 53 - SPEED DRILL - Four-Column Addition

Job 54 - PAYROLL

Course Outline (Continued)

Job 55 - PAYROLL SUMMARY

Job 56 - TOUCH ADDITION - Eight-Digit Numbers

Job 57 - SPEED DRILL - Six-, Seven-, and Eight-Column Addition

Job 58 - DEVISING TABLES OF NUMBERS

Job 59 - COMMISSIONS

Job 60 - TEST NUMBER SIX

The Office Practice Course was revised in 1960. It is available in bound form. The material consists of 23 jobs.

The reference for the Office Practice Course is listed below:

| Title | Source |
|---|---|
| Place and Hicks,<br>COLLEGE SECRETARIAL PROCEDURES<br>Second Edition | Gregg Publishing Division<br>McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |

A detailed outline of the Office Practice Course follows:

Job No. 1

Course Introduction
A Secretary's Role in Business

Job No. 2

Personality and Human Relations

Job No. 3

Dictation and Transcription

Job No. 4

Incoming Mail

Job No. 5

Outgoing Mail Procedures

Job No. 6

Filing and Records Organization

Job No. 7

Filing Systems and Maintenance

Job No. 8

A Secretary's Role in Public Relations

Job No. 9

Telephone Techniques and Services

Course Outline (Continued)

Job No. 10

Using Telegraph Services

Job No. 11

Communications: The Business Letter

Job No. 12

Sources of Information

Job No. 13

Travel Services

Job No. 14

Banking Procedures

Job No. 15

Financial Records

Job No. 16

Secretarial Procedures in Buying and Selling

Job No. 17

Reports, Manuscripts, and Legal Documents

Job No. 18

Meetings and Conferences

Job No. 19

Duplicating Procedures and Equipment

Job No. 20

Office Machines

Job No. 21

Launching Your Secretarial Career

Course Outline (Continued)

Job No. 22

Becoming a Member of the Team

Job No. 23

Looking Ahead to Supervision and Management

OFFICE OCCUPATIONS
PAYROLL RECORDS AND ACCOUNTING
Trade Preparatory

The Payroll Accounting Course was written in 1958 and revised in 1963. It is available in bound form. This material consists of 10 jobs.

The reference for this course is listed below:

| Title | Source |
|---|---|
| John A. Pendery and<br>B. Lewis Keeling<br>PAYROLL RECORDS AND ACCOUNTING, 1963 | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |

A detailed outline of the Payroll Accounting Course follows:

Job 1

Need for Payroll Records

Job 2

Computing and Paying Wages and Salaries

Job 3

Old-Age, Survivors', and Disability Benefits and Taxes

Job 4

Federal Unemployment Insurance and Taxes

Job 5

State Unemployment Compensation and Taxes

Job 6

Withholding for Income Tax Purposes

Job 7

Personnel Records

Job 8

Payroll Records

Course Outline (Continued)

Job 9

Payroll Accounting

Job 10

Project

The Personal Development Course was written in 1958 and revised in 1963. It is available in bound form. The material covers 21 Lesson Plans

The references for the Personal Development Course are listed below.

| Title | Source |
|---|---|
| TODAY'S SECRETARY<br>$4.00 | Gregg Publishing Division<br>McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| P. S. FOR PRIVATE SECRETARIES<br>$15.00 | The Bureau of Business Practice<br>24 Rope Ferry Road<br>Waterford, Connecticut |
| BETTER SECRETARIES SERIES<br>$24.00 | Prentice-Hall, Inc.<br>Englewood Cliffs,<br>New Jersey |

A detailed outline of the Personal Development Course follows:

Lesson Plan 1 - Personalities

Lesson Plan 2 - Getting a Job

Lesson Plan 3 - First Job

Lesson Plan 4 - Secretarial Attitudes

Lesson Plan 5 - Adjusting to the Job

Lesson Plan 6 - Secretarial Cooperation

Lesson Plan 7 - Job Growth

Lesson Plan 8 - Organization and Planning

Lesson Plan 9 - Adjusting to Change

Lesson Plan 10 - Initiative vs. Aggressiveness

Lesson Plan 11 - Making Compliments Count

Lesson Plan 12 - The Extemporaneous Talk

Lesson Plan 13 - The Extemporaneous Talk Cont'd.

Course Outline (Continued)

Lesson Plan 14 - Telephone Techniques

Lesson Plan 15 - Tagline for Success

For Men

Lesson Plan 16 - Clean as a Whistle

Lesson Plan 17 - Fit as a Fiddle

Lesson Plan 18 - Time to Attire

Lesson Plan 19 - Strictly Business

For Women

Lesson Plan 16 - You and Your Grooming

Lesson Plan 17 - Your Face

Lesson Plan 18 - Your Hair

Lesson Plan 19 - Your Clothing

Lesson Plan 20 - Your Figure

Lesson Plan 21 - Your Hands and Feet

OFFICE OCCUPATIONS
POSTING MACHINE
Trade Preparatory

C Page 1 of 1

The Posting Machine Course was written in 1961. It is available in bound form. The material covers 14 jobs.

Due to the many makes of machines used for this course there can be no one text applicable. Posting data is supplied for each job and the text or reference is obtainable from the instructor.

A detailed outline of the Posting Machine Course follows:

Job 1 Opening of Accounts and Posting Old Balances

Job 2 Posting Invoices and Receipts

Job 3 Posting Invoices and Receipts

Job 4 Posting Invoices and Receipts

Job 5 Posting Invoices and Receipts

Job 6 Posting Invoices and Receipts

Job 7 Posting Invoices and Receipts

Job 8 Posting Invoices and Receipts

Job 9 Posting Invoices and Receipts

Job 10 Posting Invoices and Receipts

Job 11 Posting Invoices and Receipts

Job 12 Opening of Accounts and Posting of Old Balances

Job 13 Posting Data from Payroll Sheet

Job 14 Posting Data from Payroll Sheet

OFFICE OCCUPATIONS
PRINTING CALCULATOR

The Printing Calculator Course was recently written and is available in bound form. The material covers 12 jobs.

A detailed outline of the Printing Calculator Course follows:

Job 1 Addition and Subtraction

Job 2 Multiplication

Job 3 Cumulative Multiplication

Job 4 Percentage--Discounts

Job 5 Use of Constants--Payroll

Job 6 Division

Job 7 Averaging

Job 8 Multi-factor--Multiplication and Division--Interest

Job 9 Chain Discounts

Job 10 Proration

Job 11 Review

Job 12 Review

The Rotary Calculator Course was written in 1955 and revised in 1963. It is available in bound form. The material covers 30 jobs.

The reference for the Rotary Calculator Course is listed below:

| Title | Source |
|---|---|
| Agnew and Pasewark<br>ROTARY CALCULATOR COURSE<br>4th Edition | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |

A detailed outline of the Rotary Calculator Course follows:

Job 1 - ADDITION - Zeros, One- and Two-Digit Numbers

Job 2 - ADDITION - Three-, Four- and More-Digit Numbers

Job 3 - SUBTRACTION

Job 4 - CONSTANTS - Addition and Subtraction

Job 5 - SPEED DRILL - Addition

Job 6 - MULTIPLICATION - Decimals

Job 7 - MULTIPLICATION - Fixed Decimal Point

Job 8 - DIVISION

Job 9 - SPEED DRILL - Subtraction

Job 10 - TEST NO. 1

Job 11 - DIVISION - Decimals

Job 12 - MULTIPLICATION - Accumulative

Job 13 - PERCENTAGE

Job 14 - MULTIPLICATION - Negative; Short-Cut Methods

Job 15 - SPEED DRILL Multiplication

Job 16 - MULTIPLICATION - Constant Multiplication; Double Multiplication

Job 17 - DISCOUNT AND NET AMOUNT

Course Outline (Continued)

Job 18 - CHAIN DISCOUNTS

Job 19 - SPEED DRILL - Division

Job 20 - TEST NO. 2

Job 21 - PERCENTAGES OF INCREASE AND DECREASE

Job 22 - MULTIPLICATION - Compound

Job 23 - DIVISION - Reciprocal Method

Job 24 - INTEREST

Job 25 - SPEED DRILL - Multiplication with Decimals

Job 26 - ADDITION - Compound

Job 27 - DIVISION - Build-up Method
Simultaneous Division and Multiplication

Job 28 - CREDIT BALANCES

Job 29 - SPEED DRILL - Division with Decimals

Job 30 - TEST NO. 3

The Salesmanship Course was revised in 1960. It is available in bound form. This material consists of 30 assignments.

The reference for the Salesmanship Course is listed below:

| Title | Source |
|---|---|
| Wingate-Nolan<br>FUNDAMENTALS OF SELLING,<br>7th Edition, 1959 | South-Western Publishing Co.<br>5101 Madison Road.<br>Cincinnati 27, Ohio |

A detailed outline of the Salesmanship Course follows:

Part I
Chapter I
    Assignment 1 - What is Selling?

Part I
Chapter II
    Assignment 2 - Types of Selling

Part I
Chapter III
    Assignment 3 - How Goods Reach the Consumer

Test No. 1--Part I

Part II
Chapter IV
    Assignment 4 - Why the Consumer Buys

Part II
Chapter V
    Assignment 5 - Analysis of Customer Demand

Part II
Chapter VI
    Assignment 6 - Consumer Goods

Part II
Chapter VII
    Assignment 7 - Market Resources for Consumer Goods

Test No. 2--Part II

Part III
Chapter VIII
    Assignment 8 - The Seller's Personality--Physical Characteristics

Course Outline (Continued)

Part III
Chapter IX
Assignment 9 - The Seller's Personality--Mental Characteristics

Part III
Chapter X
Assignment 10 - The Seller's Use of English

Part III
Chapter XI
Assignment 11 - The Seller's Use of Arithmetic

Test No. 3--Part III

Part IV
Chapter XII
Assignment 12 - The Technique of Locating Customers

Part IV
Chapter XIII
Assignment 13 - Preparing to Meet Customers

Part IV
Chapter XIV
Assignment 14 - Opening the Sale

Part IV
Chapter XV
Assignment 15 - Analyzing the Customer's Wants

Part IV
Chapter XVI
Assignment 16 - Presenting a Planned Sales Story

Part IV
Chapter XVII
Assignment 17 - Handling the Customer's Objections

Part IV
Chapter XVIII
Assignment 18 - Closing the Sale

Part IV
Chapter XIX
Assignment 19 - Plus Selling

Test No. 4--Part IV

Course Outline (Continued)

Part V
Chapter XX
Assignment 20 - Advertising as a Sales Tool

Part V
Chapter XXI
Assignment 21 - Selling by Means of Letters

Part V
Chapter XXII
Assignment 22 - Selling by Means of Effective Display

Part V
Chapter XXIII
Assignment 23 - Selling by Telephone

Part V
Chapter XXIV
Assignment 24 - Selling by Means of Radio, Television, and Other Presentations

Test No. 5--Part V

Part VI
Chapter XXV
Assignment 25 - Sales Promotion Policies

Part VI
Chapter XXVI
Assignment 26 - Business Service Policies

Part VI
Chapter XXVII
Assignment 27 - Ethical Treatment of Customers

Part VI
Chapter XXVIII
Assignment 28 - Ethical Treatment of Competitors and Others

Part VI
Chapter XXIX
Assignment 29 - Meeting the Demands of Modern Consumer

Test No. 6--Part VI

Part VII
Chapter XXX
Assignment 30 - How to Secure a Job

The Shorthand Course was written in 1955 and rewritten in 1958. It is available in bound form. The material covers 70 jobs.

The reference for Shorthand Course is listed below.

| Title | Source |
|---|---|
| Leslie, Zoubek, Hosler, GREGG SHORTHAND SIMPLIFIED FOR COLLEGES, Volume 1, 2nd Edition | Gregg Publishing Division<br>McGraw-Hill Book Co., Inc.<br>330 West 42 nd Street<br>New York 36, New York |

The detailed outline of the Shorthand Course follows:

Job 1
  Paragraph 1 through 11
Job 2
  Paragraph 12 through 17
Job 3
  Paragraph 18 through 23
Job 4
  Paragraph 24 through 31
Job 5
  Paragraph 32 through 40
Job 6
  Paragraph 41 through 53
Job 7
  Paragraph 54 through 61
Job 8
  Paragraph 62 through 71
Job 9
  Paragraph 72 through 80
Job 10
  Paragraph 81 through 92
Job 11
  Paragraph 93 through 102
Job 12
  Paragraph 103 through 111
Job 13
  Paragraph 112 through 118
Job 14
  Paragraph 119 through 125
Job 15
  Paragraph 126 through 133
Job 16
  Paragraph 134 through 142
Job 17
  Paragraph 143 through 150
Job 18
  Paragraph 151 through 161

Course Outline (Continued)

- Job 19
  - Paragraph 162 through 169
- Job 20
  - Paragraph 170 through 179
- Job 21
  - Paragraph 180 through 187
- Job 22
  - Paragraph 188 through 196
- Job 23
  - Paragraph 197 through 205
- Job 24
  - Paragraph 206 through 210
- Job 25
  - Paragraph 211 through 219
- Job 26
  - Paragraph 220 through 231
- Job 27
  - Paragraph 232 through 242
- Job 28
  - Paragraph 243 through 252
- Job 29
  - Paragraph 253 through 263
- Job 30
  - Paragraph 264 through 269
- Job 31
  - Paragraph 270 through 281
- Job 32
  - Paragraph 282 through 289
- Job 33
  - Paragraph 290 through 300
- Job 34
  - Paragraph 301 through 307
- Job 35
  - Paragraph 308 through 315
- Job 36
  - Paragraph 316 through 320
- Job 37
  - Paragraph 321 through 332
- Job 38
  - Paragraph 333 through 345
- Job 39
  - Paragraph 346 through 352
- Job 40
  - Paragraph 353 through 359
- Job 41
  - Paragraph 360 through 368
- Job 42
  - Paragraph 369 through 375

Course Outline (Continued)

Job 43
  Paragraph 376 through 383
Job 44
  Paragraph 384 through 390
Job 45
  Paragraph 391 through 398
Job 46
  Paragraph 399 through 407
Job 47
  Paragraph 408 through 417
Job 48
  Paragraph 418 through 423
Job 49
  Paragraph 424 through 433
Job 50
  Paragraph 434 through 444
Job 51
  Paragraph 444 through 453
Job 52
  Paragraph 454 through 461
Job 53
  Paragraph 462 through 469
Job 54
  Paragraph 470 through 474
Job 55
  Paragraph 475 through 480
Job 56
  Paragraph 481 through 486
Job 57
  Paragraph 487 through 494
Job 58
  Paragraph 495 through 500
Job 59
  Paragraph 501 through 505
Job 60
  Paragraph 506 through 510
Job 61
  Paragraph 511 through 515
Job 62
  Paragraph 516 through 521
Job 63
  Paragraph 522 through 526
Job 64
  Paragraph 527 through 531
Job 65
  Paragraph 532 through 536
Job 66
  Paragraph 537 through 540

Course Outline (Continued)

Job 67
  Paragraph 541 through 546
Job 68
  Paragraph 547 through 551
Job 69
  Paragraph 552 through 555
Job 70
  Paragraph 556 through 562

The Spelling Course was written in 1955 and rewritten in 1958 and again in 1962. It is available in loose leaf form. An Instructor's Guide is available in book form. The material covers 38 jobs.

The reference for the Spelling Course is listed below:

| Title | Source |
|---|---|
| Oberly-Silverthorn<br>COLLEGE SPELLING for<br>Businessman's Vocabulary<br>3rd Edition | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |

The detailed outline of the Spelling Course follows:

Introduction

Job 1 - Student Study Sheet

Job 2 - Unit I - Adding a Suffix

Job 3 - Unit I - Adding a Suffix

Job 4 - Unit II - Working With Words

Job 4A - Rules of Hyphenation

Job 5 - Unit II - Working With Words

Job 6 - Unit III - Words Ending in Silent "e," "ie," & "y"

Job 7 - Unit III - Words Ending in Silent "e," "ie," & "y"

Job 8 - Unit III - Words Ending in Silent "e," "ie," 7 "y"

Job 9 - Unit IV - Words Containing "ei" & "ie" Sequences

Job 10 - Unit IV - Words Containing "ei" & "ie" Sequences

Job 11 - Unit V - Plural Form of Nouns

Job 12 - Unit V - Plural Form of Nouns

Job 13 - Unit V - Plural Form of Nouns

Job 14 - Unit VI - Possessive Forms of Nouns

Job 15 - Unit VI - Possessive Forms of Nouns

Course Outline (Continued)

Job 16 - Unit VI - Possessive Forms of Nouns

Job 17 - Unit VII - How to Build and Spell Related Words - Prefixes

Job 18 - Unit VII - How to Build and Spell Related Words - Prefixes

Job 19 - Unit VIII - Suffixes

Job 20 - Unit VIII - Suffixes

Job 21 - Unit VIII - Suffixes

Job 22 - Unit IX - Troublesome Suffixes

Job 23 - Unit IX - Troublesome Suffixes

Job 24 - Unit IX - Troublesome Suffixes

Job 25 - Unit IX - Troublesome Suffixes

Job 26 - Unit IX - Troublesome Suffixes

Job 27 - Unit IX - Troublesome Suffixes

Job 28 - Unit X - Troublesome Suffixes (Continued)

Job 29 - Unit X - Troublesome Suffixes (Continued)

Job 30 - Unit X - Troublesome Suffixes (Continued)

Job 31 - Unit XI - Troublesome Suffixes (Concluded)

Job 32 - Unit XI - Troublesome Suffixes (Concluded)

Job 33 - Unit XI - Troublesome Suffixes (Concluded)

Job 34 - Unit XII - Synonyms

Job 35 - Unit XII - Synonyms

Job 36 - Unit XIII - Miscellaneous Words

Job 37 - Unit XIV - Miscellaneous Words (Continued)

Job 38 - Unit XV - Miscellaneous Words (Concluded)

The Ten-Key Adding-Listing Machine Course was written in 195 and revised in 1963. It is available in bound form. This material consists of 30 jobs.

The reference for this course is listed below.

| Title | Source |
|---|---|
| Agnew-Pasewark<br>TEN-KEY ADDING-LISTING AND PRINTING CALCULATOR COURSE<br>Third Edition | South-Western Publishing Co.<br>5101 Madison Road<br>Cincinnati 27, Ohio |

A detailed outline of the Ten-Key Adding-Listing Machine Course follows.

Job 1 Touch Addition

Job 2 Touch Addition

Job 3 Addition of Numbers Containing Repeated Digits and Varied Number of Digits

Job 4 Subtraction and Correction of Errors

Job 5 Speed Drill--Addition

Job 6 Sub-Total Key

Job 7 Repeat Addition

Job 8 Multiplication

Job 9 Speed Drill--Addition

Job 10 Test No. 1

Job 11 Short-Cut Multiplication--Zeros in the Multiplier

Job 12 Decimals, Fractions, and Percentages

Job 13 Fixed Decimal Point

Job 14 Discount and Net Amount

Job 15 Speed Drill--Addition

Job 16 Chain Discounts

Course Outline (Continued)

Job 17 Constant Multiplication

Job 18 Division

Job 19 Speed Drill-Addition

Job 20 Test No. 2

Job 21 Division (Remainder in Quotient)
(Decimals in Quotient)
(Decimals in Dividend and Divisor)

Job 22 Credit Balances

Job 23 Interest

Job 24 Percentage of Increase and Decrease

Job 25 Speed Drill-Addition

Job 26 Prorating

Job 27 Payrolls

Job 28 Reconciliation of Bank Statements

Job 29 Speed Drill-Addition

Job 30 Test No. 3

OFFICE OCCUPATIONS
TYPEWRITING
Trade Preparatory

The Typewriting material was revised in 1966. It is available in book form. This material covers thirty five units.

The reference for this course is listed below.

| Title | Source |
|---|---|
| Lloyd, Rowe, and Winger<br>GREGG TYPEWRITING FOR COLLEGES<br>Second Edition | Gregg Publishing Division<br>McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |

The Practical Nurse Course was published in 1954 and Book I and Book II revised in 1959, Book III revised in 1960.

Book I - Jobs (Related Study Assignments and Procedure Sheets)
Book II - Jobs (Related Study Assignments and Procedure Sheets)
Book III

The references for the Practical Nurse Education Course are the following:

| Title | Source |
|---|---|
| BOOK I | |
| Dakin, Thompson, LeBaron,<br>SIMPLIFIED NURSING, Sixth Ed., 1956 | J. B. Lippincott Company<br>Philadelphia, Pa. |
| Gill, Helen,<br>BASIC NURSING, Fourth Ed., 1958 | The Macmillan Company<br>Sixty Fifth Avenue<br>New York 44, New York |
| Rapier,<br>PRACTICAL NURSING, 1st Ed., 1958 | C. V. Mosby<br>St. Louis, Missouri |
| Tabers,<br>MEDICAL DICTIONARY | J. A. Majors Company<br>New Orleans, Louisiana |
| State Department of Health,<br>SANITARY CODE | U. S. Government Printing Office<br>Washington 25, D. C. |
| Van Bearson, Carolyn,<br>GETTING READY TO BE A MOTHER | The Macmillan Company<br>Sixty Fifth Avenue<br>New York 44, New York |
| Gorbin, Hazel,<br>GETTING READY TO BE A FATHER | The Macmillan Company<br>Sixty Fifth Avenue<br>New York 44, New York |
| PRENATAL CARE | U. S. Government Printing Office<br>Washington, D. C. |
| Federal Security Agency,<br>PRENATAL CARE | U. S. Government Printing Office<br>Washington 25, D. C. |
| Children's Bureau Publishers<br>No. 325<br>PREMATURE INFANTS | U. S. Government Printing Office<br>Washington 25, D. C. |

References (Continued)

| Title | Source |
|---|---|
| BOOK I (Continued) | |
| PREMATURE MANUAL OF MEDICAL AND NURSING PROCEDURES | Charity Hospital<br>New Orleans, Louisiana |
| Walling[illegible],<br>NURSING CARE OF PREMATURE INFANTS | American Journal of Nursing |
| Children's Bureau Publication,<br>INFANT CARE No. 8, 1951 | U. S. Government Printing Office<br>Washington 25, D. C. |
| YOUR CHILD FROM ONE TO SIX<br>YOUR CHILD FROM SIX TO TWELVE | U. S. Children's Bureau<br>Publication 30 |
| SOME SPECIAL PROBLEMS OF CHILDREN | National Mental Health<br>Foundation |
| GUIDING THE ADOLESCENT | Children's Bureau Publication<br>225 |
| Weiss, M. Olga,<br>ATTITUDES IN PSYCHIATRIC NURSING CARE | G. P. Putnam's Sons<br>210 Madison Avenue<br>New York 16, New York |
| Roberson,<br>PSYCHIATRIC AIDE | The Macmillan Company<br>Sixty Fifth Avenue<br>New York 44, New York |
| BOOK II | |
| Wiship,<br>TOGETHER WE WORK | American Dietetic Association |
| Rust, Justin,<br>TODAYS HOME LIVING | J. B. Lippincott Co.<br>Philadelphia, Pa. |
| Mitchell and Bernard,<br>FOOD IN HEALTH AND DISEASE | F. A. Davis Company<br>Philadelphia, Pennsylvania |
| Peyton,<br>PRACTICAL NUTRITION | J. B. Lippincott Company<br>Philadelphia, Pennsylvania |
| Howe,<br>NUTRITION FOR PRACTICAL NURSES | W. B. Saunders Company<br>Philadelphia, Pennsylvania |

References (Continued)

| Title | Source |
|---|---|
| BOOK II (Continued) | |
| Bulletins<br>THE HEART OF THE HOME | American Heart Association |
| MANAGE YOUR TIME | Louisiana State University<br>Baton Rouge, Louisiana |
| WAYS TO CONSERVE TIME AND ENERGY | Bureau of Educational Service<br>Washington |
| HOUSE CLEANING MANAGEMENT AND METHODS | Farmers Bulletin #1834<br>U. S. D. A. |
| Hurst,<br>THE 1-2-3 OF HOMEMAKING | Prentice Hall<br>Englewood Cliffs, New Jersey |
| Moore,<br>WHAT SHALL WE EAT AND WHY | State Department of Health |
| FOOD FACTS | American Dietetic Association |
| FAMILY FARE | United States Department of Agriculture |
| Harris Henderson,<br>FOODS | D. C. Heath and Company<br>285 Columbus Avenue<br>Boston 16, Massachusetts |
| Bulletin:<br>L.S.U.; HARMONY IN TABLE SETTING AND SERVICE | County Home Demonstration Agent |
| Bulletin:<br>MEAT FOR THRIFTY MEALS | U. S. D. A. |
| Darling<br>EMOTIONAL FACTORS IN OBESITY AND WEIGHT | American Dietetic Association |

A detailed outline of the Practical Nurse Education Course follows:

BOOK I

Job 1

P.S. - Pretest in Arithmetic

R.S.A. 1 - History of Practical Nursing
R.S.A. 2 - Orientation - Co-workers and Community
R.S.A. 3 - Classifications and Organization of Hospitals
R.S.A. 4 - Orientation - School and Hospital
R.S.A. 5 - Orientation - How to Study
R.S.A. 6 - Mathematics - Table of Whole Numbers

Job 2 - Set Up a Patient Unit

P.S. 1 - How to Clean and Care for Supplies and Equipment
P.S. 2 - How to Strip a Bed, Dispose of Soiled Linen and Care for Equipment
P.S. 3 - How to Care for Cleaning Equipment and Dispose of Waste
P.S. 4 - How to Arrange Equipment and Restock Patient's Unit
P.S. 5 - How to Make a Closed.and Open Bed

R.S.A. 1 - Introduction to Health and the Importance of Cleanliness
R.S.A. 2 - Selection of Bedmaking Supplies
R.S.A. 3 - Principles of Heat, Light and Ventilation
R.S.A. 4 - Working Relations - The Nurse in the Home
R.S.A. 5 - Introduction to Charting - Letters and Rules of Punctuation
R.S.A. 6 - Mathematics: Addition of Whole Numbers
R.S.A. 7 - Mathematics: Subtraction of Whole Numbers
R.S.A. 8 - Mathematics: Multiplication of Whole Numbers
R.S.A. 9 - Mathematics: Division of Whole Numbers
R.S.A. 10 - How to Regulate Heat, Light and Ventilation

Job 3 - Care and Maintenance of Linen and Utility Rooms and Medicine Cabinets

P.S. 1 - How to Maintain Orderly Linen and Utility Rooms

R.S.A. 1 - Introduction to Charting Numerals

Course Outline (Continued)

BOOK I (Continued)

Job 3 (Continued)

P.S. 2 - How to Clean Linen and Utility Rooms, Check and Obtain Linen Supply
P.S. 3 - How to Clean, Arrange and Maintain Medicine Cabinet

R.S.A. 2 - Mathematics: Fractions
R.S.A. 3 - Care and Storage of Medicines in Hospital and Home
R.S.A. 4 - Mathematics: Addition of Fractions
R.S.A. 5 - Subtraction of Fractions
R.S.A. 6 - Multiplication and Division of Fractions

Job 4 - Admit the Patient

P.S. 1 - How to Assemble and fill out a clinical chart
P.S. 2 - How to Get the Patient into Bed
P.S. 3 - How to Place the Patient upon Stretcher and remove Patient From Stretcher
P.S. 4 - How to Undress the Patient
P.S. 5 - How to Put on a Gown or Pajamas
P.S. 6 - How to Care for Clothing and Valuables
P.S. 7 - How to Get Patient Out of Bed
P.S. 8 - How to Take Temperatures
P.S. 9 - How To Clean and Disinfect Clinical Thermometers
P.S. 10 - How to Take a Rectal Temperature
P.S. 11 - How to Count the Pulse
P.S. 12 - How to Count Respiration
P.S. 13 - How to Give and Remove a Bedpan

R.S.A. 1 - Introduction to Body Structure and Function
R.S.A. 2 - Working Relationships
R.S.A. 3 - Mathematics - Decimals
R.S.A. 4 - Mathematics - Addition and Subtraction of Decimals
R.S.A. 5 - Mathematics - Multiplication and Division of Decimals
R.S.A. 6 - Admission of Patient to Hospital
R.S.A. 7 - Temperature, Pulse and Respiration

Course Outline (Continued)

BOOK I (Continued)

Job 4 (Continued)

P.S. 14 - How To Give and Remove a Urinal
P.S. 15 - How to Collect a Voided Specimen of Urine From an Adult
P.S. 16 - How to Measure Fluid Intake and Output
P.S. 17 - How to Weigh and Measure an Adult Patient

Job 5 - Make a Patient Comfortable.

P.S. 1 - How to Maintain Good Body Alignment
P.S. 2 - How to Give Oral Hygiene and Care of Dentures
P.S. 3 - How to Prepare a Patient for a Meal, Serve a Tray, and Feed the Patient
P.S. 4 - How to Remove Gown or Pajamas
P.S. 5 - How to Give A.M. Care
P.S. 6 - How to Give a Bed Bath
P.S. 7 - How to Give a Partial Bath
P.S. 8 - How to Give a Tub Bath
P.S. 9 - How to Give Shower Bath
P.S. 10 - How to Give Back Rub
P.S. 11 - How to Care for Fingernails and Toenails
P.S. 12 - How to Brush and Comb Hair
P.S. 13 - How to Give Treatment for Pediculi

R.S.A. 1 - The Skeletal System
R.S.A. 2 - The Muscular System
R.S.A. 3 - The Skin
R.S.A. 4 - The Digestive System
R.S.A. 5 - Personal Hygiene in Relation to Skin, Hair, Nails, Posture, Feet, Mouth and Food

Course Outline (Continued)

BOOK I (Continued)

Job 5 (Continued)

P.S. 14 - How to Make an Occupied Bed
P.S. 15 - How to Make an Occupied Bed From Head to Foot
P.S. 16 - How to Give Shampoos
P.S. 17 - How to Care for Flowers
P.S. 18 - How to Use Bedside Rails
P.S. 19 - How to Fill and Apply an Ice Cap
P.S. 20 - How to Fill Hot Water Bottle and Apply Heating Pad
P.S. 21 - How to Give Evening Care
P.S. 22 - How to Apply Supporting Measures

Job 6 - Transfer the Patient

P.S. 1 - How to Put Patient into a Wheel Chair
P.S. 2 - How to Transfer a Patient

R.S.A. 1 - Mathematics--Percentage

Job 7 - Discharge a Patient

P.S. 1 - How to Return Valuables, Dress, and Discharge a Patient

R.S.A. 1 - Discharging a Patient
R.S.A. 2 - Mathematics--The Metric System

Job 8 - Physical Examination of Adult

P.S. 1 - How to Assemble Supplies, Prepare a Patient and Assist Physician with an Examination
P.S. 2 - How to Care for the Clean Instruments
P.S. 3 - How to Handle Sterile Supplies
P.S. 4 - How to Take Blood Pressure

R.S.A. 1 - Discovering Health Assets and Liabilities
R.S.A. 2 - The Care and Cleaning of Instruments
R.S.A. 3 - Sterilization
R.S.A. 4 - Working Relationships

Course Outline (Continued)

BOOK I (Continued)

Job 9 - Care of Pre-operative and Post-operative Patients

- P.S. 1 - How to "Prepare" a Patient for Surgery
- P.S. 2 - How to Dress a Patient for Surgery
- P.S. 3 - How to Prepare and Give a Hypodermic
- P.S. 4 - How to Make a Recovery Bed
- P.S. 5 - How to Set Up a Surgical Dressing Tray and Change Dressings
- P.S. 6 - How to Assist with an Intravenous Infusion-Hypodermoclysis and Cut Down
- P.S. 7 - How to Care for Selected Patients Reacting from an Anesthetic
- P.S. 8 - How to Set Up and Care for Suction Drainage Apparatus
- P.S. 9 - How to Insert a Rectal Tube
- P.S. 10 - How to Give Intramuscular Injections
- P.S. 11 - How to Care for a Patient in Shock
- P.S. 12 - How to Use the Davis Patient Roller
- P.S. 13 - How to Apply Breast, Abdominal, and T-Binders

- R.S.A. 1 - Principles of Surgical Nursing
- R.S.A. 2 - Regulations for the Use of Narcotics
- R.S.A. 3 - Anesthetics
- R.S.A. 4 - Treatment of Shock (Medical and Surgical)
- R.S.A. 5 - Cancer
- R.S.A. 6 - Allergy
- R.S.A. 7 - Burns
- R.S.A. 8 - The Use and Care of Syringes and Needles

Job 10 - Care of a Patient in an Isolated Unit

- P.S. 1 - How to Set Up a Unit for Isolated Patient
- P.S. 2 - How to Put on Gown and Mask
- P.S. 3 - How to Care for Valuables and Clothing

- R.S.A. 1 - Principles of Communicable Disease Nursing
- R.S.A. 2 - Communicable Disease Control
- R.S.A. 3 - Working with Patients, Families, and Community Agencies

Course Outline (Continued)

BOOK I (Continued)

Job 10 (Continued)

P.S. 4 - How to Care for Body Excreta
P.S. 5 - How to Care for Bed Linens
P.S. 6 - How to Care for Dishes
P.S. 7 - How to Care for Mattresses, Pillows, and Floors

Job 11 - Care of a Patient With Disease or Condition of the Reproductive System

| | |
|---|---|
| P.S. 1 - How to Give a Vaginal Irrigation | R.S.A. 1 - Structure and Function of the Male and Female Reproductive System |
| P.S. 2 - How to Insert a Vaginal Suppository or Instill Vaginal Cream | R.S.A. 2 - Some diseases of the Reproductive System |

Job 12 - Care of the Patient with Kidney and Bladder Disorder

| | |
|---|---|
| P.S. 1 - How to Do a Catheterization | R.S.A. 1 - Structure and Function of the Urinary System |
| P.S. 2 - How to Do a Bladder Irrigation | R.S.A. 2 - Some Disorders of the Urinary System |
| P.S. 3 - How to Do a Bladder Instillation | R.S.A. 3 - Review Metric System |
| P.S. 4 - How to Assist with a P.S.P. Test | |
| P.S. 5 - How to Test Urine for Albumin | |

Job 13 - Care of the Male Patient With Prostatic Resection

| | |
|---|---|
| P.S. 1 - How to Care for a Patient with a Prostatic Resection | R.S.A. 1 - Structure and Function of the Male Genito-Urniary System |

Course Outline (Continued)

BOOK I (Continued)

Job 14 - Care of Patient with Disease or Condition of the Digestive System.

P.S. 1 - How to Give a Sitz Bath
P.S. 2 - How to Give Oral Medications
P.S. 3 - How to Collect a Specimen of Feces
P.S. 4 - a. How to Give Enemas (Cleansing)
  b. How to Give Enemas (Retention)
  c. How to Give Enemas (Proctocylsis)
P.S. 5 - How to Insert a Rectal Suppository
P.S. 6 - How to Remove a Fecal Impaction
P.S. 7 - How to Give a Colonic Flush
P.S. 8 - How to Collect a Specimen of Vomitus
P.S. 9 - How to Give Liquid Feedings Through Indwelling Tube
P.S. 10 - How to Assist with a Gastric Analysis
P.S. 11 - How to Assist with the Removal of Fluid from the Abdominal Cavity
P.S. 12 - How to Care for a Colostomy
P.S. 13 - How to Prepare a Patient for X-Ray and Fluoroscopic Examinations

R.S.A. 1 - Structure and Function of the Digestive System
R.S.A. 2 - Some of the Diseases and Conditions of the Digestive System
R.S.A. 3 - Collecting a Specimen of Feces for an Adult or Child
R.S.A. 4 - Administration of Drugs by Mouth
R.S.A. 5 - Preparation of a Patient For X-ray and Fluoroscopic Examination
R.S.A. 6 - Community Health in Relation of Disease of Digestive System
R.S.A. 7 - Mathematics - The Apothecary System

Job 15 - Care of the Patient with Disease or Condition of the Endocrine System

P.S. 1 - How to Prepare Patient for Basal Metabolism Rate (BMR)

R.S.A. 1 - Structure and Function of the Endocrine Glands and Their Relationship to Other Body Structures and Functions

Course Outline (Continued)

BOOK I (Continued)

Job 15 (Continued)

P.S. 2 - How to Test Urine for Sugar and Acetone
P.S. 3 - How to Measure and Give Insulin by Hypodermic
P.S. 4 - How to Collect a 24 Hour Specimen of Urine

R.S.A. 2 - Some Conditions and Diseases of the Endocrine System-medical and Surgical Aspects
R.S.A. 3 - Types of Tests

Job 16 - Care of Patient with Circulatory Condition

P.S. 1 - How to Assist in Obtaining a Blood Specimen
P.S. 2 - How to Shave a Male Patient
P.S. 3 - How to Assist in the Administration of Oxygen and Carbon Dioxide
P.S. 4 - How to Give a Temperature Bath

R.S.A. 1 - Structure and Function of the Circulatory System
R.S.A. 2 - Some of the Diseases of the Circulatory System
R.S.A. 3 - Blood Pressure
R.S.A. 4 - Temperature, Pulse and Respiration
R.S.A. 5 - Legal Responsibilities of the Practical Nurse
R.S.A. 6 - Effects of Heat and Cold on Body

Job 17 - Care of Patient with a Respiratory Disease or Condition

P.S. 1 - How to Collect Sputum Specimen
P.S. 2 - How to Assist in Obtaining a Nose and Throat Specimen
P.S. 3 - How to Administer Throat Gargle
P.S. 4 - How to Administer a Nasal or throat Spray
P.S. 5 - How to Give a Steam Inhalation
P.S. 6 - How to Assist with Aspiration of the Chest Cavity
P.S. 7 - How to Administer Medication by Nebulizer

R.S.A. 1 - Structure and Function of the Respiratory System
R.S.A. 2 - Some Diseases of the Respiratory System
R.S.A. 3 - Collecting Specimens from Respiratory Structures
R.S.A. 4 - Counterirritants
R.S.A. 5 - Community Health Problems in Relation to Respiratory Diseases
R.S.A. 6 - Mathematics--Equivalents
R.S.A. 7 - Tuberculosis

## Course Outline (Continued)

## BOOK I (Continued)

### Job 18 - Care of Patient with Skin Disease

P.S. 1 - How to Apply Liquid or Ointment
P.S. 2 - How to Apply Hot and Cold Compresses
P.S. 3 - How to Give Foot or Arm Bath

R.S.A. 1 - Structure and Function of the Skin
R.S.A. 2 - Diseases and Conditions of the Skin
R.S.A. 3 - Individual and Community Health in Relation to Diseases of the Skin

### Job 19 - Care of Patient with Diseases or Conditions of the Bones and Joints

P.S. 1 - How to Assist Patient with use of Crutches
P.S. 2 - How to Care for the Orthopedic Patient

R.S.A. 1 - Care of Patients with Diseases or Conditions of the Bones and Joints

### Job 20 - Care of a Patient with Conditions and Diseases Affecting Muscles

P.S. 1 - How to Prevent and Care for Bed Sores

R.S.A. 1 - Muscular System Review
R.S.A. 2 - Diseases and Conditions Affecting Muscles

### Job 21 - Care of the Maternity Patient

P.S. 1 - How to Give Perineal Care
P.S. 2 - How to Give Perineal Light Treatment
P.S. 3 - Breast Care to the Nursing and Non-nursing Mother

R.S.A. 1 - Review R.S.A. 1 -Job 11
R.S.A. 2 - The Prenatal Period
R.S.A. 3 - The Birth Process
R.S.A. 4 - The Postnatal Period

### Job 22 - Care of the Newborn Infant

P.S. 1 - How to Set up a Nursery Unit
P.S. 2 - How to Care for the Eyes of the Newborn
P.S. 3 - How to Express Mucous from the Newborn

R.S.A. 1 - Care of the Newborn
R.S.A. 2 - The Premature Infant

Course Outline (Continued)

BOOK I (Continued)

Job 22 (Continued)

P.S. 4 - How to Weigh and Measure an Infant
P.S. 5 - How to Care for the Umbilical Cord
P.S. 6 - Bathe the Newborn (First Oil and Water Bath)
P.S. 7 - How to Care for and Wash Soiled Diapers
P.S. 8 - How to Restrain an Infant or Child
P.S. 9 - How to Assist with Physical Examination of an Infant
P.S. 10 - How to Assist with Breast Feeding
P.S. 11 - How to Prepare and Give Formula Feedings
P.S. 12 - How to Collect a Urine Specimen from Infants

Job 23 - Care of Children

P.S. 1 - How to Prepare and Give Foods Other Than Milk

R.S.A. 1 - The Infant - Its Growth and Development
R.S.A. 2 - How a Child Grows and Develops
R.S.A. 3 - Immunization
R.S.A. 4 - An Approach to Understanding Children
R.S.A. 5 - Childhood Diseases

Job 24 - Care of the Patient with Disease or Conditions of the Nervous System

P.S. 1 - How to Assist with a Lumbar Puncture

R.S.A. 1 - The Structure and Function of the Nervous System
R.S.A. 2 - Mental Health
R.S.A. 3 - Conditions and Diseases of the Nervous System

Course Outline (Continued)

BOOK I (Continued)

Job 24 (Continued)

R.S.A. 4 - Techniques of Caring for Patient with Mental and Emotional Conditions
R.S.A. 5 - Special Therapies

Job 25 - Care of Patient with Disease or Condition of the Eye

P.S. 1 - How to Give Eye Drops
P.S. 2 - How to Give an Eye Irrigation
P.S. 3 - How to Apply an Ointment to the Eye
P.S. 4 - How to Remove Non-embedded Foreign Body from Eye
P.S. 5 - How to Care for the Prosthetic Eye of a Patient

R.S.A. 1 - Structure and Function of the Eye
R.S.A. 2 - Some Diseases and Conditions of the Eye

Job 26 - Care of Patient with Ear, Nose, or Throat Disease or Condition

P.S. 1 - How to Administer Nose Drops
P.S. 2 - How to Administer Ear Drops
P.S. 3 - How to Assist with the Care of a Patient with a Tracheotomy Tube
P.S. 4 - How to Care for a Patient with a Hearing Aid

R.S.A. 1 - Structure and Function of the Ear, Nose, and Throat
R.S.A. 2 - Diseases of Ear, Nose, and Throat

Job 27 - Care of the aging and Old Patients

R.S.A. 1 - The Aging Process
R.S.A. 2 - Some Diseases and Conditions Common to the Later Years

Course Outline (Continued

BOOK I (Continued)

Job 28 - Care for the Dying Patient

R.S.A. 1 - Care for the Dying Patient

Job 29 - Care for the Body After Death

P.S. 1 - How to Care for the Body After Death

R.S.A. 1 - Care for the Body After Death

Job 30 - Relationships with Co-workers

R.S.A. 1 - Applying for Employment
R.S.A. 2 - Resigning and Leaves of Absence
R.S.A. 3 - Community Relationships
R.S.A. 4 - Evening and Night Nursing

BOOK II

Job 1 - Orientation

P.S. 1 - How to Get Acquainted With the Foods and Cookery Laboratory
P.S. 2 - Food Handling Techniques
P.S. 3 - How to Sterilize Dishes
P.S. 4 - How to Measure Food

R.S.A. 1 - Introduction to the Homemaking Course Designed to Meet the Needs of the Practical Nurse
R.S.A. 2 - Storage and Use of Equipment in the Foods and Cookery Laboratory
R.S.A. 3 - Introduction to Foods and Cookery Designed to Meet the Needs of the Practical Nurse
R.S.A. 4 - Food and Health
R.S.A. 5 - Adequate and Safe Storage of Food

Job 2 - Working Efficiently

P.S. 1 - How to Apply Work Simplification

R.S.A. 1 - Application to Work Simplification - Efficiency in Cleaning

Course Outline (Continued)

BOOK II (Continued)

Job 3 - Evaluate Dietary

P.S. 1 - How to Use Seven Basic Food Groups to Evaluate a Dietary Record
P.S. 2 - How to Use the Basic Four in Everyday Diet

R.S.A. 1 - Essentials of a Good Diet
R.S.A. 2 - The Nutrients - Carbohydrates, Proteins, and Fats
R.S.A. 3 - Minerals, Liquids, Vitamins, and Roughage in the Diet
R.S.A. 4 - Misinformation Concerning Food
R.S.A. 5 - The Nutrients - What foods are made of

Job 4 - Plan, Prepare and Serve a Simple Breakfast

P.S. 1 - How to Plan a Breakfast Menu
P.S. 2 - How to Buy Breakfast Foods
P.S. 3 - How to prepare Breakfast Trays
P.S. 4 - How to Prepare and Serve Fruit
P.S. 5 - How to Prepare and Serve Cereal
P.S. 6 - How to Prepare Beverages
P.S. 7 - How to Prepare and Serve Toast
P.S. 8 - How to Prepare and Serve Eggs
P.S. 9 - How to Arrange and Serve a Breakfast Tray

R.S.A. 1 - Breakfast Foods
R.S.A. 2 - Breakfast, an Important Meal

Job 5 - How to Plan, Buy and Serve

P.S. 1 - How to Plan Daily Menus
P.S. 2 - How to Buy Food
P.S. 3 - How to Make a Study of The Comparative Cost of Food - Field Trip (Optional)
P.S. 4 - How to Serve Meals - Family Style

R.S.A. 1 - Principles of Planning Menus
R.S.A. 2 - Managing the Budget
R.S.A. 3 - Principles of Good Table Service

Course Outline (Continued)

BOOK II (Continued)

Job 6 - Plan, Prepare and Serve a Lunch

P.S. 1 - How to Plan Lunch
P.S. 2 - How to Prepare Salads
P.S. 3 - How to Prepare and Serve Quick Breads
P.S. 4 - How to Prepare Cheese Dishes
P.S. 5 - How to Prepare Nutritious Desserts
P.S. 6 - How to Serve Lunch Family Style

R.S.A. 1 - Lunch Planning
R.S.A. 2 - Salads, Their Value and Preparation
R.S.A. 3 - Principles of Preparing and Serving Quick Bread
R.S.A. 4 - Principles of Cheese Cookery
R.S.A. 5 - Nutritious Desserts
R.S.A. 6 - Inexpensive Meats and Meat Substitutes

Job 7 - Plan, Prepare and Serve Dinner Dishes

P.S. 1 - How to Plan, Prepare and Serve Dinner Dishes
P.S. 2 - How to Broil Meat
P.S. 3 - How to Prepare Vegetables
P.S. 4 - How to Prepare White Sauce
P.S. 5 - How to Prepare a Sponge Cake

R.S.A. 1 - Planning and Serving Dinner Dishes
R.S.A. 2 - Principles of Selecting and Cooking Meat, Fish, and Poultry
R.S.A. 3 - Principles of Vegetable Cookery
R.S.A. 4 - Types of Cakes

Job 8 - The Selection of Full, Light, Soft and Liquid Diets

R.S.A. 1 - The Selection in Full, Light, Soft, and Liquid Diets

Job 9 - Prepare Foods Included in Liquid Diets

P.S. 1 - How to Prepare Cream Soup--Tomato
P.S. 2 - How to Prepare Beef Tea
P.S. 3 - How to Use Dried Milk
P.S. 4 - How to Prepare High Protein Beverages
P.S. 5 - How to Prepare High Caloric Beverages

R.S.A. 1 - Foods Included in Liquid Diet

Course Outline (Continued)

BOOK II (Continued)

Job 10 - Diets in Diseases of the Digestive System

P.S. 1 - How to Plan Menus and Prepare Foods for Bland Diets
P.S. 2 - How to Plan Menus and Prepare Foods for a Low Residue Diet
P.S. 3 - How to Plan Menus and Prepare Foods for Low Fat Diets
P.S. 4 - How to Plan Menus for Different Types of Constipation - Atonic - Spastic - Obstructive
P.S. 5 - How to Plan Food For the Patient with Diarrhea or Colitis

R.S.A. 1 - Diet in the Diseases of the Digestive System

Job 11 - Diets for Metabolism Disturbances

P.S. 1 - How to Use the Food Exchange List in Preparing a Diabetic Diet
P.S. 2 - How to Make Menus From a Given Diet Pattern

R.S.A. 1 - Principles of Diabetic Treatment by Diet
R.S.A. 2 - Principles of Diet in Other Metabolic Disturbances
1. Hyperthyroidism
   (a) Hypothyroidism
2. Gout
3. Hypoglycemia
   (a) Hyperinsulinism
   (b) Fasting hypoglycemia Addisons Diseases
4. Tetany

Job 12 - Discuss the Problems of Weight

P.S. 1 - How to Plan, Prepare and Serve Menus for the Obese
P.S. 2 - How to Plan, Prepare and Serve Menu's for the Underweight

R.S.A. 1 - The Relation of Obesity to Health and Disease
R.S.A. 2 - The Relation of Underweight to Health and Disease

Course Outline (Continued)

BOOK II (Continued)

Job 13 - Diets for Circulatory Diseases

P.S. 1 - How to Select and Plan Diets Low in Sodium
P.S. 2 - Plan and Prepare Diets in Anemia
P.S. 3 - Plan and Prepare Low Cholesterol Diet

R.S.A. 1 - Low Sodium Diets
R.S.A. 2 - Diet in Anemia
R.S.A. 3 - Low Cholesterol Diets

Job 14 - Select and Plan Diets for Some Acute and Chronic Diseases

P.S. 1 - How to Plan a Day's Intake for Tuberculosis Patient
P.S. 2 - How to Plan a Days Intake for Patient With Cancer
P.S. 3 - How to Plan a Days Intake for a Patient with Febrile Diseases

R.S.A. 1 - Special Feeding Problems Due to Physiological and Psychological Changes
R.S.A. 2 - Special Dietary Needs in Cancer
R.S.A. 3 - Special Dietary Needs in Febrile Diseases
R.S.A. 4 - Special Dietary Needs in Tuberculosis

Job 15 - Meeting the Food Needs During Pregnancy and Lactation

P.S. 1 - How to Select a Day's Diet for Pregnant Woman
P.S. 2 - How to Select a Days Food for Lactating Women

R.S.A. 1 - Food Needs During Pregnancy
R.S.A. 2 - The Food Needs During Lactation

Job 16 - Meeting the Food Needs of the Infant

P.S. 1 - How to Make a Table for the Introduction of New Foods. Make a Table Showing the Increasing Quantity of Food as Baby Grows

R.S.A. 1 - Meeting the Food Needs of the Infant

Job 17 - Meeting the Food Needs of Children of Various Age Groups

P.S. 1 - How to Plan a Day's Meals for a 2 Year Old Boy, 6 year old Boy, and a 14 year old Girl (Mother and Father)

R.S.A. 1 - Food Need of Pre-School and School Age Children and Adolescents

Course Outline (Continued)

BOOK II (Continued)

Job 18 - Meeting Food Needs During the Golden Years

| | |
|---|---|
| P.S. 1 - How to Plan Good Nutrition for the Geriatric Patient | R.S.A. 1 - The Food and Social Needs for the Golden Years |

Job 19 - How to Plan Menus for A Patient with an Allergy

| | |
|---|---|
| P.S. 1 - How to Plan Menus for a Patient with an Allergy | R.S.A. 1 - Allergies and Skin Disturbances |

Job 20 - Food Habits for Various Religious and Racial Groups

| | |
|---|---|
| | R.S.A. 1 - Food Habits of Various Religious and Racial Groups |

BOOK III

Suggested Content for Classes During Clinical Experience

Introduction

Suggested Outline for Planned Clinical Instruction

Medical and Surgical Nursing
  The Respiratory System
  The Endocrine System
  The Digestive System
  The Circulatory System
  The Eyes
  The Ears

Geriatric Nursing

Communicable Disease Nursing

Poliomyelitis Nursing

Orthopedic Nursing

Urological Nursing

Gynecological Nursing

Course Outline (Continued)

BOOK III (Continued)

Introduction to Psychiatric Nursing

Obstetrical Nursing and Care of the Newborn

Pediatric Nursing

Course Plan for Hospital Dietary Training for Student Practical Nurses

RELATED SCIENCE OF PRACTICAL PHYSICS
Trade Preparatory

The Related Science of Practical Physics Course was published in 1960 and is available in bound form. It is composed of twenty-nine experiments and study units. The reference for the Related Science of Practical Physics Course is listed below.

| Title | Source |
|---|---|
| Dull, Metcalfe, and Brooks<br>MODERN PHYSICS | Holt, Rinehart and Winston, Inc.<br>383 Madison Ave.<br>New York 17, New York |

A detailed outline of the Related Science of Practical Physics Course follows:

EXPERIMENTS IN PHYSICS FOR INDUSTRIAL TECHNICIANS

Experiment No.

I. Weights and Measures

II. Simple Machines: Levers and Pulleys

III. Work, Power, and Friction

IV. Pressure in Liquids

V. Pressure of Air

*VI. Liquids and Gases in Motion

VII. Elasticity and Strength of Materials
Surface Tension

VIII. Forces Acting Through a Point

IX. Accelerated Motion

X. The Laws of Motion

XI. Potential and Kinetic Energy

XII. Heat and Expansion

XIII. Transmission of Heat

XIV. Steam and Gas Engines

*Denotes Study Unit.

Course Outline (Continued)

XV. Magnetism

XVI. Electricity at Rest
(Static Electricity

XVII. Electric Currents

XVIII. Electric Circuits

XIX. Magnetic and Chemical Effects of Electric Current

*XX. Electric Power, Heating and Lighting

XXI. Electric Generators and Motors

XXII. Induction Coils and Transformers

XXIII. Alternating Current

Study Unit No.

XXIV. Modern Physics

XXV. Sound Waves

XXVI. Musical Sounds

XXVII. Lenses and Optical Instruments

XXVIII. Spectra and Color

XXIX. Cathode and X-Rays, Radioactivity

*Denotes Study Unit

The Radio-Television-Electronics Course was published in 1953, revised in 1959 and 1962, and again in 1963. It is available in book form for the instructors and in loose form for distribution to students.

Related Study Assignments, Question and Answer Sheets and Jobs
- Book I - Units 1 - 10
- Book II - Units 11 - 17
- Book III - Unit 18
- Book IV - Unit 19
- Book V - Unit 19

Test Books
- Book I - Units 1 - 10
- Book II - Units 11 - 17
- Book III - Unit 18
- Book IV - Unit 19

Answer Book
- Complete for all tests

The following instructor's aids are available:
- Individual Folder Type Progress Chart

The references for the Radio-Television Course are listed below.

| Title | Source |
|---|---|
| Watson, Welch, and Eby<br>UNDERSTANDING RADIO | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Marcus, Abraham<br>RADIO SERVICING | Prentice-Hall<br>Englewood Cliffs, New Jersey |
| Oldfield, R. L.<br>RADIO, TELEVISION AND BASIC ELECTRONICS | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| Marcus and Levy<br>ELEMENTS OF RADIO SERVICING | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| RADIO HANDBOOK | Editors and Engineers, Ltd.<br>Summerland, California |
| THE RADIO AMATEUR'S HANDBOOK BY ARRL | American Radio Relay League<br>225 Main Street<br>Newington, Connecticut, 06111 |

References (Continued)

| Title | Source |
|---|---|
| Ruiter, Jacob, Jr.<br>MODERN OSCILLOSCOPES AND THEIR USES | Holt, Rinehart and Winston, Inc.<br>383 Madison Avenue<br>New York 17, New York |
| Kiver<br>TRANSISTOR IN RADIO AND TELEVISION | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Grob, Bernard<br>BASIC TELEVISION | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Swiggett, Robert L.<br>INTRODUCTION TO PRINTED CIRCUITS, No. 185 | John F. Rider Publisher, Inc.<br>116 West 14th Street<br>New York 11, New York |
| The A.R.R.L. ANTENNA BOOK | American Radio Relay League<br>38 La Salle Road<br>West Hartford 7, Connecticut |
| Newitt, John H.<br>HIGH FIDELITY TECHNIQUES | Holt, Rinehart and Winston, Inc.<br>383 Madison Avenue<br>New York 17, New York |
| INVERSE FEEDBACK<br>Electronic Technology Series<br>No. 166-15 | John F. Rider Publisher, Inc.<br>116 West 14th Street<br>New York 11, New York |
| Rabinoff and Wolbrecht<br>PRINCIPLES OF TELEVISION SERVICING | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Buchsbaum, W. H.<br>COLOR TV SERVICING | Prentice-Hall<br>Englewood Cliffs, New Jersey |
| Oliphant and Ray<br>COLOR TV | Howard W. Sams & Co., Inc.<br>1720 East 38th Street<br>Indianapolis 6, Indiana |
| RETMA<br>FUNDAMENTALS OF COLOR TV | John F. Rider Publisher, Inc.<br>116 West 14th Street<br>New York 11, New York |
| MANUFACTURER'S SERVICE NOTES | Howard W. Sams & Co., Inc.<br>1720 East 38th Street<br>Indianapolis 6, Indiana |

References (Continued)

| Title | Source |
|---|---|
| TROUBLESHOOTER'S MANUALS | John F. Rider Publisher, Inc.<br>116 West 14th Street<br>New York 11, New York |
| RCA COLOR TV PICT-O-GUIDE | RCA, Electron Tube Division<br>Harrison, New Jersey |
| Darr, Jack<br>TWO-WAY MOBILE RADIO MAINTENANCE | Howard W. Sams & Co., Inc.<br>1720 East 38th Street<br>Indianapolis 6, Indiana |
| Noll, Edward M.<br>MODERN COMMUNICATIONS COURSE<br>Vols. 1, 2, and 3 | Howard W. Sams & Co., Inc.<br>1720 East 38th Street<br>Indianpolis 6, Indiana |
| Shrader, Robert L.<br>ELECTRONIC COMMUNICATION | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |

A detailed outline of the Radio-Television-Electronics Course follows.

Unit I - Construction Fundamentals
- R.S.A. 1 - Soldering and Splicing
- Job 1A - Solder Connections and Splice Wire
- Job 1B - Disconnect Soldered Connections
- R.S.A. 2 - Learn Use and Care of Hand Tools
- Job 2A - Learn Use and Care of Hand Tools
- Job 2B - Use Tools

Unit II - Magnetism
- R.S.A. 1 - Study Permanent Magnets and Magnetic Fields
- Job 1 - Study and Plot Magnetic Lines of Force
- R.S.A. 2 - Study of Electromagnetism
- Job 2 - Produce and Study Electromagnetism
- R.S.A. 3 - Study Characteristics of an Electromagnet
- Job 3 - Make an Electromagnet and Study its Characteristics

Unit III - Principles of Electricity
- R.S.A. 1 - Learn Use of Radio Symbols
- Job 1 - Learn Use of Radio Symbols
- R.S.A. 2 - Identification of Electronic Components
- Job 2 - Identification of Electronic Components
- R.S.A. 3 - Resistor Color Code
- Job 3 - Resistor Color Code
- R.S.A. 4 - Learn How Electrical Energy is Produced
- R.S.A. 5 - Learn How Electrical Energy is Measured
- Job 5 - Learn How to Measure Electrical Energy
- R.S.A. 6 - Study the Laws of Electrical Charges
- Job 6 - Study and Prove Laws of Electrical Charges
- R.S.A. 7 - Study Electron Movement

Unit IV - Ohm's Law
- R.S.A. 1 - Use Ohm's Law in Series Circuit
- Job 1 - Use Ohm's Law in Series Circuit
- R.S.A. 2 - Use Ohm's Law in Parallel Circuit
- Job 2 - Use Ohm's Law in Parallel Circuit
- R.S.A. 3 - Use Ohm's Law in Series-Parallel Circuit
- Job 3 - Use Ohm's Law in Series-Parallel Circuit
- R.S.A. 4 - Construct a Multirange Voltmeter
- Job 4 - Construct a Multirange Voltmeter
- R.S.A. 5A - Study Milliammeters
- R.S.A. 5B - Construct an Ohmmeter
- Job 5 - Construct an Ohmmeter
- Job 5A - How to Test Resistors

Course Outline (Continued)

Unit V - Inductance
- R.S.A. 1A - Study Induced Voltages
- R.S.A. 1B - Alternating and Direct Currents
- Job 1 - Produce and Study Induced Voltages
- R.S.A. 2 - Phase Relationship of Voltage and Current in an Inductor or Coil
- Job 2 - Show Phase Relationship of Voltage and Current in an Inductor or Coil
- R.S.A. 3 - Study A. C. Measuring Instruments
- Job 3 - Determine Impedance and Inductance of a Coil

Unit VI - Capacitance
- R.S.A. 1 - Study Color Code as Applied to Capacitors
- Job 1 - Identify Capacitors by Color Code
- R.S.A. 2 - Study the Capacitance or Condenser Tester
- Job 2 - Use Capacitor Tester
- R.S.A. 3 - Study of Capacitance
- Job 3 - Measure and Calculate Condenser Values
- R.S.A. 4 - Capacitance in A. C.
- Job 4 - Study Effect of A.C. and D.C. on Condensers

Unit VII - Time Constant and Resonance
- R.S.A. 1 - Capacitors and Time Constants
- Job 1 - Determine the Time Constant of RC Circuit
- R.S.A. 2A - Time Constants of LR Circuits
- R.S.A. 2B - Resonance
- Job 2A - Determine Resonant Frequency of RCL Series Circuit
- Job 2B - Determine Resonant Frequency of RCL Parallel Circuit

Unit VIII - Vacuum Tubes
- R.S.A. 1 - Study Electron Emission in Vacuum Tubes
- Job 1 - Study Electron Emission in Diode Vacuum Tube
- R.S.A. 2 - Study Electrons in Cathode Ray Tube
- Job 2 - Study Electrons in Cathode Ray Tube
- R.S.A. 3A - Study Electron Action in Diode Tube
- R.S.A. 3B - Study Diode Tube Rectifier
- Job 3 - Build and Study a Vacuum Tube Rectifier
- R.S.A. 4 - Study Rectifier Filters
- Job 4 - Construct Filter for Rectifier
- R.S.A. 5 - A.C. Power Supply for AC-DC Portable
- Job 5 - Build an A.C. Power Supply for a 3-Way Portable Radio
- R.S.A. 6 - Study the Diode Tube as a Detector
- Job 6 - Diode Detector
- R.S.A. 7 - Study the Triode Tube
- Job 7 - Induced Voltage by the Current Change in a Vacuum Tube

Course Outline (Continued)

Unit VIII -Vacuum Tubes (Cont'd)
R.S.A. 8 - Study A.C. Triode Tube
Job 8 - Study Characteristics of Triode Tube
R.S.A. 9 - Methods of Obtaining Grid Bias
R.S.A. 10 - Study the Tetrode and Pentode Tubes
Job 10 - Determine Characteristics of Pentode Tube
R.S.A. 11 - Study the Vacuum Tube Voltmeter
Job 11 - Compare Voltmeter and Vacuum Tube Voltmeter
R.S.A. 12 - Tube Testers
Job 12 - Test Tubes

Unit IX - Amplification
R.S.A. 1 - Class A Amplifier
Job 1 - Build and Study a Triode Amplifier
R.S.A. 2 - Class B Amplifier
Job 2 - Build or Study a Class B Amplifier
R.S.A. 3 - Class C Amplifier
Job 3 - Class C Amplifier
R.S.A. 4 - Coupling to the Push-Pull Amplifier Grids
Job 4 - Coupling to Push-Pull Amplifier Grids
R.S.A. 5 - Direct Coupled Amplifiers
Job 5 - Direct Coupled Amplifiers

Unit X - Transistor
R.S.A. 1 - Semiconductor Theory
Job 1 - Testing Diodes in Transistors
R.S.A. 2 - Junction Transistors NPN
Job 2 - Test for Reverse Current in Collector to Base Circuit
R.S.A. 3 - Junction Transistors PNP
Job 3 - Transistor Dynamic Gain
R.S.A. 4 - Point Contact Transistor
Job 4 - Voltage Relationship Between Elements
R.S.A. 5 - Types of Transistors
Job 5 - Voltage Distribution With Open Base Circuit
R.S.A. 6 - Transistor Amplifiers
Job 6 - Transistor Static Gain
R.S.A. 7 - Servicing Transistor Circuits
Job 7 - Transistor Amplifier
R.S.A. 8 - Test Equipment for Transistor Circuits
Job 8 - Test Equipment
Job 8A - How to Test Transistors

Unit XI - Oscillation
R.S.A. 1 - Study Oscillation
Job 1 - Build a Hartley Oscillator
R.S.A. 2 - Study Vacuum Tube Oscillators
Job 2A - Build a Crystal Oscillator

Course Outline (Continued

### Unit XI - Oscillation (Cont'd)

Job 2B - Study and Build a Modified Colpitts (Clapp) Oscillator Circuit
R.S.A. 3 - Study UHF Oscillators
Job 3 - Build a UHF Oscillator With Linear Tank
R.S.A. 4 - Study Multivibrators
Job 4 - Build and Study Multivibrator Circuit
R.S.A. 5 - Transistor Oscillators
Job 5 - Transistor Oscillator

### Unit XII - Radio Receivers

R.S.A. 1 - Study R. F. Detectors
Job 1 - Build and Study R.F. Detector Circuits
R.S.A. 2 - Study R.F. Amplifiers
Job 2 - Build and Operate a R.F. Amplifier
R.S.A. 3 - Study the Superheterodyne Receiver
Job 3 - Build and Study a 5 Tube Superheterodyne Receiver
R.S.A. 4 - Study Automatic Volume Control
Job 4 - Determine Values and Use of A.V.C. Voltage
R.S.A. 5A - Study Frequency Modulation
R.S.A. 5B - Study Receiver Alignment
Job 5A - Align a Superheterodyne Receiver
Job 5B - Align a Superheterodyne Receiver Using an Output Meter
Job 5C - Align a Superheterodyne Receiver Using a V.T.V.M. as an Output Indicator
R.S.A. 6 - Study a Three-Way Portable Radio Receiver
Job 6 - Install a Replacement Oscillator Coil and Align Receiver
R.S.A. 7 - Transistor Circuits in Radio
Job 7 - Signal Tracing and Gain Measurement
R.S.A. 8 - Troubleshooting Transistor Radios
Job 8 - Troubleshooting in Transistor Receivers
R.S.A. 9 - Servicing Transistor Radios
Job 9 - Signal Tracing Using Tuned Probe
R.S.A. 10 - Alignment of Transistor Radios
Job 10 - Alignment of Transistor Radio

### Unit XIII - Radio Troubleshooting

R.S.A. 1 - Study Methods of Signal Tracing
Job 1 - Use Signal Generator, Signal Tracer and the Oscilloscope in Signal Tracing
R.S.A. 2 - Printed Circuits and Etched Wiring
Job 2 - Power Supply
Job 3 - The I. F. Stage
Job 4 - The Local Oscillator
Job 5 - The Radio Frequency Amplifier Stage
Job 6 - How to Replace an Oscillator Coil in a Receiver With a General Replacement Type

Course Outline (Continued)

## Unit XIV - Radio Transmitters and Transmission

R.S.A. 1 - Study R. F. Power Amplifier
Job 1 - Build Oscillator and R. F. Amplifier
R.S.A. 2A - Study Neutralization of Triode R. F. Amplifier
R.S.A. 2B - Study the Frequency Doubler
Job 2 - Operate a Frequency Doubler
R.S.A. 3A - Study Push-Pull R. F. Amplifiers
R.S.A. 3B - Study Modulation Methods
Job 3 - Build and Operate a Plate Modulator
R.S.A. 4A - Study F. M. Transmission
R.S.A. 4B - Study Antennas
R.S.A. 4C - Theory of Wave Propagation
Job 4 - Parasitic Elements
R.S.A. 5 - Antennas for UHF and VHF
Job 5 - Demonstrate Standing Waves on Transmission Lines
Job 6 - Line of Sight Theory Demonstration
Job 7 - Plot Field Strength of a Vertical Antenna

## Unit XV - Hi-Fidelity

R.S.A. 1 - High Fidelity Systems
Job 1 - Impedance Matching
R.S.A. 2A - Loud Speakers
R.S.A. 2B - High Fidelity Speaker Enclosures
R.S.A. 2C - Electrical Cross-over Net Works
Job 2 - Calculation and Design of Negative Feedback Network
R.S.A. 3A - Records and Record Players
R.S.A. 3B - Tape Recording and Playback
Job 3 - Tape Recording
R.S.A. 4A - The Photo Electric Cell
R.S.A. 4B - Sound Information on Film
R.S.A. 4C - Methods of Obtaining Power of the Exciter Lamp in Sound-on-film Reproduction
Job 4 - Motion Picture Sound

## Unit XVI - Advanced Test Equipment

R.S.A. 1 - Study the Oscilloscope
Job 1 - Learn Use of the Oscilloscope
R.S.A. 2 - Study Sweep and Marker Generators
Job 2 - Learn Use of Sweep and Marker Generators
R.S.A. 3 - Study the Cross Hatch Generator
Job 3 - Learn Use of the Cross Hatch Generator
R.S.A. 4 - Study Voltage Calibrator
Job 4 - Learn Use of Voltage Calibrator
R.S.A. 5 - Frequency Standards and Sub-Standards
Job 5 - Learn Use of Frequency Standard
R.S.A. 6 - General Application of Test Equipment
Job 6 - Test Probes

Course Outline (Continued)

Unit XVII - Black and White Television
R.S.A. 1 - Study the Television System
Job 1 - Receiver Familiarization
R.S.A. 2 - Study Picture Tubes
Job 2 - Observe the Television Signal
R.S.A. 3 - Study TV Receiver Block Diagrams
Job 3 - Receiver Block Diagrams
R.S.A. 4 - Study Sound I.F. Stages and Detector Types
Job 4A - Align TV Sound I.F. Stages
Job 4B - Troubleshooting Sound Section Circuits
R.S.A. 5 - Study Video I.F. Amplifiers
Job 5 - Build and Align a Video I.F. Strip
R.S.A. 6 - Study Video I.F. Alignment
Job 6 - Troubleshooting Video Section Circuits
R.S.A. 7 - Study TV RF Tuners
Job 7A - Check Front End Response of TV Set
Job 7B - Front End Familiarization
R.S.A. 8 - Study TV Tuner Alignment
Job 8 - Align a TV Tuner
R.S.A. 9 - Study Second Detectors and Video Amplifiers
Job 9 - Build and Test a Video Amplifier
R.S.A. 10 - Study TV Synchronizing Circuits
Job 10 - Build and Test a TV Sync Circuit
R.S.A. 11A - Study a Noise Immune Sync Separator
R.S.A. 11B - Study TV Sweep Circuits
Job 11A - Build and Test a TV Blocking Oscillator
Job 11B - Troubleshooting Horizontal Sweep Circuits
Job 11C - Troubleshooting Vertical Sweep Circuits
R.S.A. 12 - Study TV Power Supplies
Job 12 - Horizontal Deflection Circuit
R.S.A. 13 - Study AFC-Sync Circuits
Job 13A - Observe AFC Sync Circuit Characteristics
Job 13B - Troubleshooting Sync Circuits
R.S.A. 14 - Study AGC Circuits
Job 14 - Troubleshooting AGC Circuits
R.S.A. 15 - How to Install a Replacement Flyback Transformer
Job 15 - Install and Test a Flyback Transformer
R.S.A. 16 - Study TV Troubleshooting
Job 16 - Troubleshoot a TV Receiver
R.S.A. 17 - Transistor Circuits in Television
Job 17 - Checking Video Amplifier
R.S.A. 18 - Servicing Transistor Television
Job 18 - Troubleshooting Transistor Television
Job 19 - Trouble Shoot a TV Receiver
Job 20 - Trouble Shoot a TV Receiver
Job 21 - Trouble Shoot a TV Receiver
Job 22 - Trouble Shoot a TV Receiver
Job 23 - Trouble Shoot a TV Receiver
Job 24 - Trouble Shoot a TV Receiver
Job 25 - Trouble Shoot a TV Receiver

Course Outline (Continued)

Unit XVIII - Color Television
Part I

R.S.A. 1 - Compatible Color TV System
R.S.A. 2 - An Introduction to the Basic Color TV System
R.S.A. 3 - Color Standards
R.S.A. 4 - The Color Spectrum
R.S.A. 5 - Wave Lengths of Different Hues
R.S.A. 6 - Color Mixing to Produce a Desired Hue
R.S.A. 7 - Some Characteristics of Vision
R.S.A. 8 - The Standard Color Chart

Part II

R.S.A. 1 - A General Discussion of the Color Standards
R.S.A. 2 - Vectors Applied to Analysis of Two-Phase Modulation
R.S.A. 3 - The Color Sub-Carrier
R.S.A. 4 - Spectrum Analysis of a Conventional Television Signal
R.S.A. 5 - Frequency Interleaving
R.S.A. 6 - I and Q Signals
R.S.A. 7 - Circuitry Added to a Television Receiver to Produce Color
R.S.A. 8 - Block Diagrams of a Color Receiver

Part III

R.S.A. 1 - The Tuner of Front-End Circuits
R.S.A. 2 - The Video Intermediate Frequency Stages
R.S.A. 3 - The Video Amplifier
Job 1 - Video 4.5 mc. Trap Adjustment
R.S.A. 4 - The Audio System
R.S.A. 5 - The Chroma Amplifier or Band-Pass Amplifier
R.S.A. 6 - Phase Detectors
R.S.A. 7 - Color Killer Circuits
R.S.A. 8 - I and Q Demodulators or Synchronous Detectors
R.S.A. 9 - The 3.58 mc. Reference Oscillator
R.S.A. 10 - Color Synchronization
R.S.A. 11 - Sound Intermediate Frequency and Quadrature Detector
Job 2 - Sound I. F. Alignment
R.S.A. 12 - Color Matrixing
R.S.A. 13 - Reproduction of Color

Part IV

R.S.A. 1 - Principles
R.S.A. 2 - Adjustments
R.S.A. 3 - Handling
R.S.A. 4 - Purity
R.S.A. 5 - Static Convergence
R.S.A. 6 - Dynamic Convergence
R.S.A. 7 - Convergence Circuitry
Job 1 - Dynamic Convergence Adjustments Horizontal Convergence

Course Outline (Continued)

Unit XVIII - Color Television
Part IV (Cont'd)
Job 2 - Dynamic Convergence Adjustments Vertical Convergence
R.S.A. 8 - Receiver Adjustments
Job 3 - Shop Project
Job 4 - AGC Control and Noise Threshhold Adjustment

Part V
R.S.A. 1 - Burst Amplifier and Crystal Oscillator Alignm
R.S.A. 2 - Quadrature and Demodulator Alignment
R.S.A. 3 - Chroma Channel Alignment
Job 1 - First Video Amplifier and Band Pass Amplifier Alignment
R.S.A. 4 - Video Intermediate Frequency Alignment
Job 2 - Picture I.F. Transformer Adjustments
Job 3 - Sweep Alignment of Picture I.F.
R.S.A. 5 - Sound Intermediate Frequency Alignment
R.S.A. 6 - Tuner Alignment
Job 4 - Antenna Matching Unit Alignment
Job 5 - Tuner Alignment
Job 6 - UHF Alignment
R.S.A. 7 - Test Equipment

Part VI
R.S.A. 1 - Voltage Regulation
Job 1 - Horizontal Oscillator Alignment
Job 2 - High Voltage Adjustment
R.S.A. 2 - Obtaining the Voltage for the Convergence Section
R.S.A. 3 - The Deflection Yoke
R.S.A. 4 - The Convergence Yoke
Job 3 - Preliminary Convergence and Color Purity Adjustments

Part VII
R.S.A. 1 - Color Control
R.S.A. 2 - Hue Control
Job 1 - Color AFC Alignment
R.S.A. 3 - The Contrast Control--The Brightness Control
R.S.A. 4 - The Fine Tuning Control

Part VIII
R.S.A. 1 - Phase and Matrix
R.S.A. 2 - Purity
R.S.A. 3 - Convergence
Job 1 - Convergence Coils
R.S.A. 4 - Black and White Adjustments
Job 2 - Black and White Adjustments

Course Outline (Continued)

Unit XVIII - Color Television
Part IX
- R.S.A. 1 - Checking Tuner, Video IF and Video Amplifier
- R.S.A. 2 - Signal Tracing in the Chroma Section
- Job 1 - Oscilloscope Waveforms

Part X
- R.S.A. 1 - Dot-Bar Generator
- R.S.A. 2 - Color Bar Generator
- R.S.A. 3 - The Color Stripe Signals for Testing Receivers
- R.S.A. 4 - R.F. - I.F. Alignment Equipment
- R.S.A. 5 - Video Alignment Equipment
- R.S.A. 6 - R.F., Demodulator, Low Capacity and High Voltage Probes
- R.S.A. 7 - Oscilloscopes

Part XI
- R.S.A. 1 - Antennas
- R.S.A. 2 - Transmission Lines
- R.S.A. 3 - Receiver Installation
- R.S.A. 4 - Antenna System Installation

Part XII
- R.S.A. 1 - Servicing Hints
- Job 1 - Field Adjustment of Demodulator Phasing
- R.S.A. 2 - Signal Tracing

Unit XIX - Communications
- R.S.A. 1 Modulation Systems
  - Question and Answer Sheet No. 1
  - Question and Answer Sheet No. 2
  - Question and Answer Sheet No. 3
- Job 1 Receiver Familiarization
- R.S.A. 2 Frequency Modulation
  - Question and Answer Sheet No. 4
  - Question and Answer Sheet No. 5
  - Question and Answer Sheet No. 6
  - Question and Answer Sheet No. 7
- Job 2 Receiver Voltage and Resistance
- R.S.A. 3 FM Receiver
  - Question and Answer Sheet No. 8
  - Question and Answer Sheet No. 9
  - Question and Answer Sheet No. 10
  - Question and Answer Sheet No. 11
- Job 3 FM Reciever
- R.S.A. 4 R-F Amplifier

Course Outline (Continued)

| | | |
|---|---|---|
| Unit XIX | | - Communications |
| | | Question and Answer Sheet No. 12 |
| | | Question and Answer Sheet No. 13 |
| | | Question and Answer Sheet No. 14 |
| | | Question and Answer Sheet No. 15 |
| Job | 4 | R-F Amplifier |
| R.S.A. | 5 | High Frequency Oscillator-Mixer |
| | | Question and Answer Sheet No. 16 |
| | | Question and Answer Sheet No. 17 |
| | | Question and Answer Sheet No. 18 |
| | | Question and Answer Sheet No. 19 |
| Job | 5 | High Frequency Oscillator-Mixer |
| R.S.A. | 6 | First I-F Amplifiers |
| | | Question and Answer Sheet No. 20 |
| | | Question and Answer Sheet No. 21 |
| | | Question and Answer Sheet No. 22 |
| | | Question and Answer Sheet No. 23 |
| Job | 6 | First I-F Amplifiers |
| R.S.A. | 7 | Second Mixer, Oscillator, and Second I-F Stages |
| | | Question and Answer Sheet No. 24 |
| | | Question and Answer Sheet No. 25 |
| | | Question and Answer Sheet No. 26 |
| | | Question and Answer Sheet No. 27 |
| Job | 7 | Second Mixer, Oscillator, and I-F Stages |
| R.S.A. | 8 | Limiter |
| | | Question and Answer Sheet No. 28 |
| | | Question and Answer Sheet No. 29 |
| | | Question and Answer Sheet No. 30 |
| | | Question and Answer Sheet No. 31 |
| Job | 8 | Limiters |
| R.S.A. | 9 | Discriminator |
| | | Question and Answer Sheet No. 32 |
| | | Question and Answer Sheet No. 33 |
| | | Question and Answer Sheet No. 34 |
| | | Question and Answer Sheet No. 35 |
| Job | 9 | Discriminator |
| R.S.A. | 10 | Audio Circuits and Squelch |
| | | Question and Answer Sheet No. 36 |
| | | Question and Answer Sheet No. 37 |
| | | Question and Answer Sheet No. 38 |
| | | Question and Answer Sheet No. 39 |
| Job | 10 | Audio and Squelch Circuits |
| R.S.A. | 11 | Receiver Specifications |
| | | Question and Answer Sheet No. 40 |
| | | Question and Answer Sheet No. 41 |
| | | Question and Answer Sheet No. 42 |
| | | Question and Answer Sheet No. 43 |
| Job | 11 | 20 DB Quieting Test |

Course Outline (Continued)

Unit XIX - Communications

| | | |
|---|---|---|
| R.S.A. | 12 | Receiver Servicing |
| | | Question and Answer Sheet No. 44 |
| | | Question and Answer Sheet No. 45 |
| | | Question and Answer Sheet No. 46 |
| | | Question and Answer Sheet No. 47 |
| Job | 12 | Receiver Gain Checks |
| Job | 12A | "Motrac" Receiver Stage Gain Checks |
| R.S.A. | 13 | Modulation Methods |
| | | Question and Answer Sheet No. 48 |
| | | Question and Answer Sheet No. 49 |
| | | Question and Answer Sheet No. 50 |
| | | Question and Answer Sheet No. 51 |
| Job | 13 | Transmitter Familiarization |
| Job | 13A | Citizens Band Transceiver |
| R.S.A. | 14 | Transmitter Block Diagram |
| | | Transmitter Block Diagram |
| | | Question and Answer Sheet No. 52 |
| | | Question and Answer Sheet No. 53 |
| | | Question and Answer Sheet No. 54 |
| | | Question and Answer Sheet No. 55 |
| Job | 14 | Transmitter Voltage and Resistance |
| R.S.A. | 15 | Oscillator |
| | | Question and Answer Sheet No. 56 |
| | | Question and Answer Sheet No. 57 |
| | | Question and Answer Sheet No. 58 |
| | | Question and Answer Sheet No. 59 |
| | | Question and Answer Sheet No. 60 |
| Job | 15 | Oscillator |
| R.S.A. | 16 | Phase Modulator |
| | | Question and Answer Sheet No. 61 |
| | | Question and Answer Sheet No. 62 |
| | | Question and Answer Sheet No. 63 |
| | | Question and Answer Sheet No. 64 |
| | | Question and Answer Sheet No. 65 |
| Job | 16 | Phase Modulator |
| R.S.A. | 17 | Audio Circuits |
| | | Question and Answer Sheet No. 66 |
| | | Question and Answer Sheet No. 67 |
| | | Question and Answer Sheet No. 68 |
| | | Question and Answer Sheet No. 69 |
| | | Question and Answer Sheet No. 70 |
| Job | 17 | Audio Circuits |
| R.S.A. | 18 | Frequency Multipliers |
| Job | 18 | Frequency Multipliers |
| R.S.A. | 19 | Power Amplifiers |
| Job | 19 | Power Amplifiers |

Course Outline (Continued)

Unit XIX - Communications

| | | |
|---|---|---|
| R.S.A. | 20 | Transmitter Servicing |
| Job | 20 | Transmitter Servicing |
| R.S.A. | 21 | Power Supplies - General |
| Job | 21 | Dynamotor Power Supply |
| R.S.A. | 22 | Power Supplies - Vibrator and Dynamotor |
| Job | 22 | Vibrator Power Supply |
| R.S.A. | 23 | Power Supplies - Transistor |
| Job | 23 | Transistor Power Supply |
| R.S.A. | 24 | Power Supplies - A. C. |
| Job | 24 | A. C. Power Supply |
| R.S.A. | 25 | Antennas |
| Job | 25 | Antennas |
| R.S.A. | 26 | Towers and Transmission Lines |
| Job | 26 | Tower Installation |
| R.S.A. | 27 | Mobile Installation |
| Job | 27 | Mobile Installation |
| R.S.A. | 28 | Base Station Installation |
| Job | 28 | Base Station - Remote Control |
| Job | 28A | Extender Circuit Servicing |
| R.S.A. | 29 | Test Equipment |
| Job | 29 | F. M. Station Monitor |
| R.S.A. | 30 | F. C. C. Tests and Measurements |
| Job | 30 | F. C. C. Tests and Measurements |
| R.S.A. | 31 | Selective Calling |
| Job | 31 | Tone-Coded Systems |
| R.S.A. | 32 | Preventive Maintenance |
| Job | 32 | Preventive Maintenance |
| R.S.A. | 33 | Microwave |
| Job | 33 | "Handie-Talkie" FM Radio |
| R.S.A. | 34 | Radio Relay Systems |
| Job | 34 | Stage Gain Measurement |
| R.S.A. | 35 | Trouble Shooting |
| Job | 35 | Trouble Shooting |
| Job | 36 | Trouble Shooting |
| Job | 37 | Trouble Shooting |
| Job | 38 | Trouble Shooting |
| Job | 39 | Trouble Shooting |
| Job | 40 | Trouble Shooting |
| R.S.A. | 36 | International Morse Code |

The Refrigeration and Air Conditioning Course was published in 1951-52 and revised in 1962. It is available in the following forms:

| | |
|---|---|
| **Book I** | |
| Related Study Assignments | Unit I |
| Jobs | Unit I |
| Mathematics | Unit I |
| **Book II** | |
| Related Study Assignments | Units II & III |
| Jobs | Units II & III |
| Mathematics | Units II & III |
| **Book III** | |
| Related Study Assignments | Unit IV |
| Jobs | Unit IV |
| Mathematics | Unit IV |
| **Book IV** | |
| Related Study Assignments | Unit V |
| Jobs | Unit V |
| Mathematics | Unit V |
| **Test Book** | |
| Book I | Units I, II, & III |
| Book II | Units IV & V |

Answer Book
    Complete for tests and math

The following instructor's aids are available:
    Class Progress Chart (Pad)
    Individual Folder Type

The references for the Refrigeration & Air Conditioning Course are the following:

| Title | Source |
|---|---|
| ABC'S OF HAND TOOLS | General Motors Corporation<br>General Motors Technical Center<br>Warren, Michigan |
| IMPERIAL TUBE WORKING HANDBOOK No. 369-B | Imperial Eastman Corporation<br>Imperial Brass Division<br>6300 West Howard Street<br>Chicago 48, Illinois |

References (Continued)

| Title | Source |
|---|---|
| Olivo and Marsh<br>PRINCIPLES OF REFRIGERATION | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Althouse and Turnquist<br>MODERN REFRIGERATION AND AIR CONDITIONING | The Goodheart-Willcox Co., Inc.,<br>1322 South Wabash Avenue<br>Chicago 5, Illinois |
| Anderson, Edwin P.<br>AUDEL'S REFRIGERATION AND AIR CONDITIONING GUIDE | Theo. Audel and Co.<br>49 West 23rd Street<br>New York 10, New York |
| IMPERIAL CATALOG No. 80-A | Imperial Eastman Corporation<br>Imperial Brass Division<br>6300 West Howard Street<br>Chicago 48, Illinois |
| A TO ZERO OF REFRIGERATION | General Motors Corporation<br>General Motors Technical Center<br>Warren, Michigan |
| NEW MASTER SERVICE MANUAL No. N-1 | Business News Publishing Co.<br>450 West Fort Street<br>Detroit 26, Michigan |
| BASIC REFRIGERATION-PRINCIPLES-PRACTICE-OPERATION | Nickerson and Collins Co.<br>433 Waller Ave.<br>Chicago 44, Illinois |
| Magnus-Marlott<br>HANDBOOK OF REFRIGERATION AND AIR CONDITIONING | Follett Publishing Co.<br>1010 W. Washington Blvd.<br>Chicago 7, Illinois |
| BASIC BENCH-METAL PRACTICE AND PRECISION MEASURING | The Manual Arts Press<br>Peoria, Illinois |
| HOW TO RUN A LATHE, Vol. 1 | South Bend Lathe Works<br>South Bend 22, Indiana |
| REFRIGERATION PROBLEMS AND THEIR SOLUTIONS, Manuals J-1, J-2, J-3, J-4, and J-5 | Business News Publishing Co.<br>450 W. Fort Street<br>Detroit 26, Michigan |

References (Continued)

| Title | Source |
|---|---|
| COPELAMETIC PARTS | Copeland Refrigeration Corp.<br>Sidney, Ohio |
| COPELAMETIC CONDENSING UNIT AND MOTOR-COMPRESSOR SERVICE MANUAL | Copeland Refrigeration Corp.<br>Sidney, Ohio |
| NORGE ROLLATOR REFRIGERATION SERVICE OPEN TYPE SYSTEM | Norge Appliance Service Dept.<br>Borg-Warner Corp.<br>Sherman Blvd. Plant<br>Mushegon Heights, Michigan |
| HANDBOOK OF AUTOMATIC REFRIGERANT CONTROLS | Alco Valve Company<br>865 Kingland Avenue<br>St. Louis 5, Missouri |
| Millikan, Robert A.<br>MAGNETISM | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| Dunlap and McDougal,<br>CURRENT ELECTRICITY | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| McDougal, Wynne L.,<br>SERIES AND PARALLEL CIRCUITS | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| Richter, H. P.<br>PRACTICAL ELECTRICAL WIRING | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Crouse, William H.<br>ELECTRICAL APPLIANCE SERVICING | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| M-H AIR CONDITIONING CONTROLS (Electric) REFERENCE MANUAL | Minneapolis-Honeywell Regulator Company<br>2747 Fourth Avenue South<br>Minneapolis 8, Minnesota |
| THE NATIONAL ELECTRICAL CODE | National Board of Fire Underwriters<br>85 John Street<br>New York 38, New York |

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| Title | Source |
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| Rosenberg, Robert<br>ELECTRIC MOTOR REPAIR | Holt, Rinehart and Winston, Inc.<br>383 Madison Ave.<br>New York 17, New York |
| Veinott, G. G.<br>FRACTIONAL HORSEPOWER ELECTRIC MOTORS | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| CUTLER-HAMMER REFRIGERATION CONTROL CATALOG | Cutler-Hammer, Inc.<br>Milwaukee 1, Wisconsin |
| RANCO MANUAL No. 1058 and No. 1244 | Ranco, Inc.<br>601 W. Fifth Avenue<br>Columbus 1, Ohio |
| Rolf, Oliver K.<br>REBUILDING HERMETIC UNITS | Nickerson and Collins<br>433-435 North Waller Ave.<br>Chicago 44, Illinois |
| Lasher and Richards<br>HOW YOU CAN GET A BETTER JOB | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| PENN INSTALLATION AND SERVICE MANUAL | Penn Controls, Inc.<br>Goshen, Indiana |
| MASTER SERVICE MANUAL, COMMERCIAL REFRIGERATION, C-1 | Business News Publishing Co.,<br>450 W. Fort Street<br>Detroit 26, Michigan |
| SPORLAN VALVE CO. CATALOG No. 55 | Sporlan Valve Company<br>7525 Sussex Avenue<br>St. Louis 17, Missouri |
| SAFETY CODE FOR MECHANICAL REFRIGERATION | The American Society of Refrigerating Engineers<br>234 Fifth Avenue<br>New York 1, New York |
| Anderson, Edwin P.<br>AUDEL'S PLUMBERS AND STEAM FITTERS GUIDE | Theo. Audel and Company<br>49 West 23rd Street<br>New York 10, New York |
| TRANE AIR CONDITIONING MANUAL | The Trane Company, Educational Division<br>LaCrosse, Wisconsin |

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| Title | Source |
|---|---|
| AIR CONDITIONING AND REFRIGERATING DATA BOOK, Application Volume | The American Society of Refrigerating Engineers<br>234 Fifth Avenue<br>New York 1, New York |
| TRANE REFRIGERATION MANUAL | The Trane Company, Educational Division<br>LaCrosse, Wisconsin |
| AIR CONDITIONING AND REFRIGERATING DATA BOOK, Design Volume | The American Society of Refrigerating Engineers<br>234 Fifth Avenue<br>New York 1, New York |
| AUTOMATIC CONTROL OF HEATING AND AIR CONDITIONING | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| STANDARD REFRIGERATION AND AIR CONDITIONING, QUESTIONS & ANSWERS | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Marsh, R. Warren and Olivo, C. Thomas<br>PRINCIPLES OF REFRIGERATION with INSTRUCTOR'S GUIDE | Delmar Publishers, Inc.<br>Mountainview Ave.<br>Albany 5, New York |
| COMMERCIAL AND INDUSTRIAL REFRIGERATION | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| LaSalvia, James L.<br>KEY TO AIR CONDITIONING<br>Manuals K-1, K-2, & K-3 | Business News Publishing Co.<br>450 W. Fort Street<br>Detroit 26, Michigan |

A detailed outline of the Refrigeration and Air Conditioning Course follows.

Unit I

- Math 1 - Linear Measurement
- R.S.A. 1 - Hand Tools and How to Use
- Job 1 - Identify Assigned Tools
- Math 2 - Rule Practice
- R.S.A. 2 - Working Copper Tubing
- Job 2 - Cut and Bend Copper Tubing
- Math 3 - Addition of Rule Measurements
- R.S.A. 3 - Fittings
- Job 3 - Check Sizes of Flare, Sweat, and Pipe Fittings
- R.S.A. 4 - Simplified Principles of Refrigeration
- Job 4 - Flare and Connect Copper Tubing
- R.S.A. 5 - How to Solder Connections and Use Halide Leak Detector
- Job 5 - Swedge and Solder Copper Tubing
- Math 4 - Subtraction of Rule Measurements
- Math 5 - Addition of Whole Numbers
- Math 6 - Subtraction of Whole Numbers
- R.S.A. 6 - Service Valves
- Job 6 - Disassemble and Reassemble Service Valves
- R.S.A. 7 - Refrigeration Gauges
- Job 7 - Install and Remove High and Low Pressure Gauges
- R.S.A. 8 - Principles of Refrigeration
- Job 8 - Identify Screws, Bolts, and Nuts
- Math 7 - Reducing Fractions to Lowest Terms
- R.S.A. 9 - Screw, Bolt, and Nut Sizes
- Math 8 - Changing Improper Fractions to Mixed Numbers
- Math 9 - The Micrometer
- R.S.A. 10 - The Lathe
- R.S.A. 11 - Compressors and Compressor Parts
- Job 9 - Disassemble, Clean and Check Compressor
- R.S.A. 12 - Compressor Repairing Precision Work
- Job 10 - Repair Compressor Parts
- Job 11 - Reassemble Compressor
- R.S.A. 13 - Refrigerant Oils
- Job 12 - Service and Test Compressor
- Math 10 - Changing Mixed Numbers to Improper Fractions
- Math 11 - Changing Fractions to Higher Terms
- R.S.A. 14 - Serviceable Hermetic Compressor Part
- Job 13 - Disassemble, Repair and Reassemble A Serviceable Hermetic Compressor
- Math 12 - Least Common Denominators
- Job 14 - Service A Rotary Compressor
- Math 13 - Addition of Fractions
- R.S.A. 15 - Shop Sketching

Course Outline (Continued)

Unit I (Continued)
- R.S.A. 16 - Condensers and Receivers
- Job 15 - Clean A Condenser and A Receiver
- R.S.A. 17 - Shop Sketching, Forming Figures
- Job 16 - Check a Low Side and A High Side Float
- Math 14 - Subtraction of Fractions
- R.S.A. 18 - Expansion Valve Refrigerator System
- Job 17 - Check and Adjust Automatic Expansion Valve
- Math 15 - Multiplication of Fractions
- Job 18 - Check and Adjust Thermostatic Expansion Valve
- R.S.A. 19 - Capillary Tube
- Math 16 - Division of Fractions
- Job 19 - Check Capillary Tube System
- R.S.A. 20 - Evaporators
- Job 20 - Test and Repair Evaporators
- Math 17 - The Decimal System

Unit II
- R.S.A. 1 - Magnetism
- Job 1 - Determine the Polarity of Magnets and the Existence of Magnetic Fields
- R.S.A. 2 - Current Electricity and Electro-Magnetism
- Job 2 - Make an Electromagnet and Study its Characteristics
- R.S.A. 3 - Electric Circuits, Series and Parallel
- Job 3 - Series and Parallel Circuits
- R.S.A. 4 - Operation and Care of Volt, Ampere, Ohm, and Watt Meters
- Job 4 - Taking Meter Readings
- R.S.A. 5 - Ohm's Law
- Job 5 - Ohm's Law
- R.S.A. 6 - Types of Refrigeration and Air Conditioning Controls
- Job 6A - Connect a Combination High Pressure and Low Pressure Control
- Job 6B - Connect a Temperature Control
- Job 6C - Connect 3-Phase Motor Controlled by a Remote Start-Stop Pushbutton
- R.S.A. 7 - Types of Relays
- Job 7 - Connecting Relays
- R.S.A. 8 - Insulation and Current Capacity of Conductors
- Job 8 - Measure Sizes of Wire
- R.S.A. 9 - Electric Motors
- Job 9A - Disassemble, Check, and Reassemble A Split-Phase Motor and A Capacitor Start Motor
- Job 9B - Disassemble, Check, and Reassemble a Three Phase Motor
- Job 9C - Disassemble, Check, and Reassemble R. I. Motor

Course Outline (Continued)

Unit II (Continued)
- R.S.A. 10 - Universal Motors
- Job 10 - Disassemble, Check and Reassemble Universal Motor
- R.S.A. 11 - Construction, Operation and Connections of Capacitors
- Job 11 - Testing Capacitors
- R.S.A. 12 - Capacitor Motors
- Job 12 - Disassemble, Repair and Reassemble A Capacitor-Start Motor

Unit III
- Math 1 - Square and Cubic Measurements and Multiplication of Whole Numbers
- R.S.A. 1 - Practical Theory of Refrigeration
- Math 2 - Division of Whole Numbers
- R.S.A. 2 - Moisture, Air and Foreign Matter
- Job 1 - Refill Small Refrigerant Cylinder
- R.S.A. 3 - Refrigerants
- Job 2 - Check Refrigerant Cylinder Pressure
- R.S.A. 4 - Sealed Unit Refrigerators
- Job 3 - Check Electrical System on Sealed Units
- Job 4 - Make Trouble Shooter Chart Using Manufacturer's Manual
- Job 5 - Check Sealed Unit, Using Chart, and Determine Trouble in A Written Diagnosis
- Job 6 - Check A Sealed Unit System
- Job 7 - Check And Replace Thermostatic Motor Control in Electrical System. Explain Functions and Give Reason For Replacing
- Job 8 - Replace a Defective Cabinet Light Switch in Electrical Circuit and Make Free Hand Sketch of Entire Electrical System
- Job 9 - Check a Sealed Unit For a "Grounded Unit" - "To Housing" - "Between Windings"
- Job 10 - Identify Motor Terminals and Run Sealed Unit With A Starting Cord
- R.S.A. 5 - Absorption Type Refrigerator
- Job 11 - Reverse Rotation on A Sealed Unit
- Job 12 - Open A Sealed Unit and Check Whether or Not It Is Repairable
- Job 13 - Repair A Leaking Motor Terminal On A Sealed Unit
- Job 14 - Check Sealed Unit For Refrigerant Leak, Repair and Recharge Unit - Make Written Diagnosis of Leak and Method of Repair

Course Outline (Continued)

Unit III (Continued)
Job 15 - Replace A Major Component of a Sealed Unit - Give Type Solder and Flux Used
Job 16 - Dehydrate, Charge and Operate Unit Repaired In Job 15
R.S.A. 6 - Expansion Valve
Job 17 - Rewire Sealed Unit System
Math 3 - Making and Reading Line Graphs
Job 18 - Assemble Unit With A.E.V., Using Reciprocating Compressor
Job 19 - Assemble Unit With A Thermostatic Expansion Valve
R.S.A. 7 - Capillary Tube Refrigerator Systems
Job 20 - Assemble Unit With Capillary Tube
R.S.A. 8 - Domestic Refrigeration Servicing
R.S.A. 9 - Dual Temperature Refrigerator
Job 21 - Check and Repair A Combination Home Freezer-Refrigerator
R.S.A. 10 - Personal and Social Problems - Getting and Holding a Job
Job 22 - Check and Repair A Capillary Tube, Open Type Refrigerator
R.S.A. 11 - Home Freezer
Job 23 - Check and Repair A Home Freezer With Capillary Tube Control
R.S.A. 12 - Cabinets, Cabinet Repairing and Refinishing
Job 24 - Replace Door Gasket
Job 25 - Repair or Replace Cabinet Hardware
Job 26 - Refinish Refrigerator Cabinet

Unit IV
R.S.A. 1 - Motor Controls
Job 1 - Adjust Low Pressure Motor Control
Math 1 -Simple Percentage
Job 2 - Check and Adjust Thermostatic Motor Control
Job 3 - Adjust High Pressure Control and A Combination Control
Math 2 - Discount
R.S.A. 2 - Advanced Refrigeration Fundamentals and Commercial Evaporators
Job 4 - Install Gravity Coil In Reach-In Box Using Air-Cooled Condensing Unit
Job 5 - Replace The Gravity Coil With a Blower-Coil on Job No. 4
Math 3 - Evaporator Capacity
R.S.A. 3 - Commercial Refrigeration Valves and Controls
Job 6 - Service Water Regulating Valves

Course Outline (Continued)

Unit IV (Continued)

- R.S.A. 4 - American Standard Safety Code for Mechanical Refrigeration
- Job 7 - Clean (Small)Water Cooled Condenser
- R.S.A. 5 - Pipe Sizes
- Job 8 - Thread and Connect Pipe
- R.S.A. 6 - Condensing Units and Refrigerant Pipes
- Job 9 - Install Gravity Coil in Walk-In Box Using Water-Cooled Condensing Unit
- Math 4 - Compressor Capacity
- Job 10 - Replace the Gravity Coil With a Blower Coil on Job No. 9
- R.S.A. 7 - Multiple Systems
- Job 11 - Install A Complete Multiple Unit (Same temperature)
- Job 12 - Install A Solenoid Valve and Thermostatic Control on Job No. 10.
- R.S.A. 8 - Commercial Refrigeration Systems
- Job 13 - Install A Two-Temperature Valve Job
- Job 14 - Install and/or Operate Hot Gas Defrost on Job
- R.S.A. 9 - Commercial Refrigeration Installation
- Job 15 - Install and Operate Water Defrost
- R.S.A. 9A - Wet and Dry Type Beverage Coolers
- Job 16 - Install or Service a Wet Beverage Cooler
- Job 17 - Install or Service a Dry Beverage Cooler
- Math 5 - Refrigerant Pipe Capacity
- Job 18 - Service a Water Cooler
- Job 19 - Construct and/or Install or Service Small Ice Maker
- R.S.A. 10 - Miscellaneous Refrigeration Equipment
- Job 20 - Construct and/or Install Counter-Flow Condenser
- Job 21 - Install Oil Separator on Unit
- Math 6 - Service Orders
- Job 22 - Construct and/or Install Heat Interchanger
- R.S.A. 11 - Cooling Water
- Job 23 - Construct and/or Install Evaporative Condensers
- Job 24 - Check a Forced Draft Water Tower
- R.S.A. 12 - Evaporative Condensers
- R.S.A. 13 - Commercial Refrigeration - Electrical
- Job 25 - Install and/or Connect Single Phase Motor Using Magnetic Switch
- Job 26 - Install and/or Connect Three Phase Motor Using Magnetic Switch
- Job 27 - Install and/or Connect Three Phase Motor Using Magnetic Switch and Pilot Relay
- R.S.A. 14 - Low Temperature and R-22
- Job 28 - Check Operation of Ice Cream Cabinet
- Job 29 - Construct and/or Check Low Temperature Unit
- Math 7 - Parts and Supply Orders

Course Outline (Continued)

Unit IV (Continued)
- Job 30 - Install and Check a Plate Coil
- R.S.A. 15 - Heat Pumps
- Job 31 - Construct and Operate a Heat Pump
- R.S.A. 16 - Ammonia System
- Job 32 - Design and Sketch An Ammonia System
- R.S.A. 17 - Factors That Affect Commercial Refrigeration
- R.S.A. 18 - Commercial Refrigeration Calculations and Heat Load
- Job 33 - Survey and Calculate a Heat Load
- Math 8 - Job Costs
- R.S.A. 19 - Safety and First Aid for the Refrigeration Service Engineer

Unit V
- R.S.A. 1 - Air Conditioning Equipment
- Job 1 - Install and/or Check Portable Air Conditioning Unit
- R.S.A. 2 - Heat Temperature and Comfort
- Job 2 - Check Installation of Window Unit
- Job 3 - Remove Cabinet From Window Unit Identifying Component Parts and Make a Trouble Shooters Chart on a Room Unit Using Mfgs. Service Manual
- Job 4 - Check and Repair Electrical System on a Room Unit--Make Repairs if Necessary
- Job 5 - Check Sealed Unit For "Grounded Out" Motor-to-Housing--Between Windings and Identify Motor Terminals as Running, Starting, Common--Give Method Used
- Job 6 - Open a Defective Sealed Unit to Find Cause of Failure--Give Method Used for Repair
- Job 7 - Check and Clean Filter--Replace if Necessary
- Job 8 - Check Condensate and Explain What Use is Made of it By the Condenser and Condenser Fan
- Job 9 - Replace a Major Component Part of a Room A/C Unit--Make Complete Service Report
- Job 10 - Check Air Flow With Anemometer or Velometer
- Job 11 - Install and/or Check Self-Contained Unit
- R.S.A. 3 - Heat Gains, Part I and Part II
- Job 12 - Check Relative Humidity
- R.S.A. 4 - Residential Winter Air Conditioning
- Job 13 - Install or Check Residential Forced Air Heating System
- R.S.A. 5 - Properties of Air
- Job 14 - Install a Complete Remote Air Conditioning Unit
- R.S.A. 6 - The Psychrometric Chart
- Job 15 - Check and Oil Motors on Air Conditioning System

Course Outline (Continued)

Unit V (Continued)

R.S.A. 7 - Air Conditioning Calculations, Part I
Math 1 - Measurement of Angles
Job 16 - Check or Install and Operate Duct-type Heater Coil in Air Conditioning System. Install Necessary Controls
R.S.A. 8 - Ducts and Fans
Job 17 - Install Modulating Motor System
Job 18 - Check the Efficiency of Atmospheric Tower as Compared to Forced Draft Tower
Job 19 - Balance a Duct System
R.S.A. 9 - Air Conditioning Calculations, Part II
Job 20 - Survey and Calculate a Cooling Load
R.S.A. 10 - Automotive Air Conditioning and Controls
Job 21 - Servicing Automotive Air Conditioning Unit

SHEET METAL COURSE
Trade Preparatory & Apprentice

The Sheet Metal Course was written in 1958. It is available in the following form.

Related Study Assignment
Book 1

Test
Available in loose form

Others
Blueprint Reading and Sketching - Petroleum Industry Workers

Successful Soldering by Louie S. Taylor

Student Study Guide in Sheet Metal Work - for apprentices on-the-job Trainers and other Learners

A detailed outline of the Related Study Assignments follows:

R.S.A. 1 - Machine Processes - Bar Folder

R.S.A. 2 - Machine Processes - Hand Brake

R.S.A. 3 - Machine Processes - Forming Rolls

R.S.A. 4 - Machine Processes - Squaring Shears

R.S.A. 5 - Machine Processes - Beading Machine

R.S.A. 6 - Machine Processes - Crimping Machine

R.S.A. 7 - Machine Processes - Turning Machine

R.S.A. 8 - Machine Processes - Burring Machine

R.S.A. 9 - Machine Processes - Drill Presses

R.S.A. 10 - Machine Processes - Grinding Wheels

R.S.A. 11 - Hand Processes - Bench Tools

R.S.A. 12 - Hand Processes - Patterns

R.S.A. 13 - Hand Processes - Hand Snips

R.S.A. 14 - Hand Processes - Forming Stakes

R.S.A. 15 - Hand Processes - Bending Metal

R.S.A. 16 - Hand Processes - Files

Course Outline (Continued)

R.S.A. 16 - Hand Processes - Files

R.S.A. 17 - Hand Processes - Soldering Coppers

R.S.A. 18 - Hand Processes - Solders and Fluxes

R.S.A. 19 - Hand Processes - Grooved Seams

R.S.A. 20 - Hand Processes - Chisels

R.S.A. 21 - Hand Processes - Stretching and Shrinking

R.S.A. 22 - Hand Processes - Solid & Hollow Punches

R.S.A. 23 - Hand Processes - Hand Punches

R.S.A. 24 - Hand Processes - Drills

R.S.A. 25 - Hand Processes - Rivets & Riveting

R.S A. 26 - Hand Processes - The Hack Saw

R.S.A. 27 - Hand Processes - Wired Edges

R.S.A. 28 - Hand Processes - Single and Double Seams

R.S.A. 29 - Hand Processes - Pittsburgh Lock

R.S.A. 30 - Test - Gable Molding With Raked Profile

R.S.A. 31 - Test - Miter - Different Profiles

R.S.A. 32 - See Instructor

R.S.A. 33 - Test - Cone & Frustum

R.S.A. 34 - See Instructor

R.S.A. 35 - Test - Irregular Frustum of Cone

R.S.A. 36 - Test - Conical Gutter Outlet

R.S.A. 37 - Test - Collar for Double Pitch Roof

R.S.A. 38 - Test - Elliptical Flaring Pan

R.S.A. 39 - Test - Tapered Square Pipe on Sq. Pipe

R.S.A. 40 - Test - Cylinder on Cone Vertically

Course Outline (Continued)

R.S.A. 41 - Test - No. 8-Cylinder on Cone Horizontally
R.S.A. 42 - Test - No. 9--Cone on Cylinder
R.S.A. 43 - Test - No. 10--Cone on Cone
R.S.A. 44 - Test - No. 1-Square to Round on Center
R.S.A. 45 - Test - No. 2-Rect., To Round off Center
R.S.A. 46 - Test - No. 3-Rect., To Round off Center- 2 Ways
R.S.A. 47 - Test - No. 4-Taper Joint off Center
R.S.A. 48 - Test - No. 5-Rectangle to Triangle
R.S.A. 49 - Test - No. 6-Irregular-Round to Oblong
R.S.A. 50 - Test - No. 7-Irregular T-Joint
R.S.A. 51 - Test - No. 8-Roof Collar Square to Round
R.S A. 52 - Test - No. 9-Scalene Cone
R.S.A. 53 - Test Noil, Flaring Roof Collar
R.S.A. 54 - Test - No. 2, Roof Collar, Square to Round
R.S.A. 55 - Test - No. 3, 3-piece Tapered Offset
R.S.A. 56 - Test - No. 4, 3-piece Reducing Elbow
R.S.A. 57 - Test - No. 5, 3-piece Transition-Square to Round
R.S.A. 58 - Test - No. 6, Furnace Boot
R.S.A. 59 - Test - No. 7, Tapering-y-Joint
R.S.A. 60 - Test - Math-Area and Volumes
R.S.A. 61 - See Instructor
R.S.A. 62 - See Instructor
R.S.A. 63 - See Instructor
R.S.A. 64 - See Instructor

The Small Craft Operation and Navigation Course was published in 1960. It is available in book form.

A detailed outline of the Small Craft Operation and Navigation Course follows:

Introduction

Part I - Rules and Regulations

Lesson 1 - Equipment Required by Regulations

Lesson 2 - Classes of Vessels

Lessons 3 & 4 - Rules of the Road

Lesson 5 - Recommended Equipment to be Carried on Small Craft

Part II - Aids to Navigation

Lesson 6 - Buoys and Markers

Lesson 7 - Lights

Lesson 8 - Charts

Lesson 9 - The Use of Charts in Piloting

Lesson 10 - Navigation in Fog and Other Conditions or Reduced Visibility

Part III - The Marine Compass and Piloting

Lesson 11 - Historical Background and Construction

Lesson 12 - Magnetism

Lesson 13 - Compass Error

Appendix A - Common Nautical Terms

Appendix B - Equipment Required on Motor Boats

Appendix C - How Safe a Skipper are You?

Appendix D - Introduction to First Aid - For Lessons 1, 2, and 3

The Small Engines Mechanics Course was recently revised and is available in the following book form for instructors. It is available in loose form for the students.

| | |
|---|---|
| Book I | |
| Related Study Assignments | Units I-VI |
| Jobs | Units I-VI |
| Mathematics | Units I-VI |
| Book II | |
| Related Study Assignments | Units VII-XIII |
| Jobs | Units VII-XIII |
| Test Book | |
| Book I | Units I-XIII |
| Answer Book | |
| For Tests and Math | Units I-XIII |

The references for the Small Engines Mechanics Course are listed below:

| Title | Source |
|---|---|
| A.B.C.'S OF HAND TOOLS | General Motors Corporation<br>General Motors Technical Center<br>Warren, Michigan |
| GENERAL REPAIR TOOLS FOR AUTO MECHANICS | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| WALDES TRUARC RETAINING RING TECHNICAL MANUAL | Waldes Kohinoor, Inc.<br>Long Island City, N. Y. |
| Catalog of Tubing Fittings | Imperial Eastman Corporation<br>Imperial Brass Division<br>6300 West Howard Street<br>Chicago 48, Illinois |
| SOLDERING SIMPLIFIED | Kester Solder Co.<br>4201 Wrightwood Avenue<br>Chicago 48, Illinois |
| Atteberry, P. H.<br>POWER MECHANICS | Goodheart-Willcox Co., Inc.<br>1322 S. Wabash<br>Chicago 5, Illinois |

References (Continued)

| Title | Source |
|---|---|
| SMALL ENGINES SERVICE MANUAL | Technical Publications, Inc.<br>1014 Wyandotte Street<br>Kansas City 5, Missouri |
| Purvis, Jud<br>ALL ABOUT SMALL GAS ENGINES | Goodheart-Willcox Co., Inc.<br>1322 S. Wabash<br>Chicago 5, Illinois |
| GENERAL THEORIES OF OPERATION | Briggs and Stratton Corporation<br>2711 North Street<br>Milwaukee 1, Wisconsin |
| Venk, Ernest<br>THE COMPLETE OUTBOARD BOATING MANUAL | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| REPAIRMAN'S HANDBOOK | Briggs and Stratton Corporation<br>2711 North Street<br>Milwaukee 1, Wisconsin |
| SMALL ENGINES SERVICE MANUAL | Implement and Tractor Pub., Inc.<br>1014 Wyandotte<br>Kansas City 5, Missouri |
| CLINTON ENGINES SALES AND SERVICE MANUAL | Clinton Engine Corporation<br>Maquoketa, Iowa |
| MASTER PARTS AND SERVICE MANUAL | Tillotson Mfg. Co.<br>Toledo 12, Ohio |
| TECUMSEH ENGINES MASTER PARTS AND SERVICE MANUAL | Tecumseh Products<br>Parts Department<br>Grafton, Wisconsin |
| CARTER CARBURETOR MASTER PARTS AND SERVICE MANUAL | Carter Carburetor Co.<br>Division of ACF Industries<br>St. Louis 7, Missouri |
| CLINTON CHAINSAW SALES AND SERVICE MANUAL | Clinton Engine Corporation<br>Maquoketa, Iowa |
| LAWN BOY SERVICE MANUAL | Lawn Boy Division of<br>Outboard Marine Corp.<br>Galesburg, Illinois |

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|---|---|
| BRIGGS AND STRATTON REPAIR INSTRUCTIONS, Form MS-3854 | Briggs and Stratton Corporation<br>2711 North Street<br>Milwaukee 1, Wisconsin |
| TECUMSEH ENGINES MECHANIC'S HANDBOOK | Tecumseh Products<br>Parts Department<br>Grafton, Wiscons |
| MAGNETO IGNITION | Fairbanks, Morse and Co.<br>600 S. Michigan Ave.<br>Chicago 5, Illinois |
| WHAT MAKES THE SPARK | R. E. Phelon Co.<br>East Longmeadow, Mass. |
| WISCONSIN ENGINES INSTRUCTIONS BOOK AND PARTS LIST | Wisconsin Motor Corp.<br>Milwaukee 46, Wisconsin |
| WICO ELECTRIC CO. SERVICE AND PARTS LIST | Wico<br>West Springfield, Mass. |
| AUTO-LITE SPARK PLUG SERVICE MANUAL | The Leech-Neville Co.<br>1347 East 51st Street<br>Cleveland 13, Ohio |
| A. C. SPARK PLUG SHOP MANUAL | Delco-Remy Division<br>General Motors Corporation<br>Anderson, Indiana |
| AUDEL'S GAS ENGINE MANUAL | Theo. Audel and Co.<br>49 West 23rd Street<br>New York 10, New York |
| BENCHWORK, DRILLS, AND DRILLING (FILM NO. 3) | Jam Handy Organization<br>2821 E. Grand Blvd.<br>Detroit, Michigan |
| BENCHWORK, REAMING, TAPPING, AND THREADING (FILM NO. 4)<br>TAPPING AND THREADING, FRAMES 46 through 96 | Jam Handy Organization<br>2821 E. Grand Blvd.<br>Detroit, Michigan |
| CUSHMAN SERVICE MANUAL | Cushman Motor Works, Inc.<br>Lincoln, Nebraska |
| Stephenson, George E.<br>POWER MECHANICS | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |

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|---|---|
| THE LAWN MOWER SERVICE MANUAL | Yard-Man Inc.<br>Jackson, Michigan |
| WESTERN TOOL AND STAMPING CO. PARTS AND PRICE CATALOG | Western Tool and Stamping Co.<br>Des Moines, Iowa |
| OPERATING INSTRUCTIONS FOR THE MODEL 900 LAWN MOWER SHARPENER | Fate-Root-Heath Company<br>Plymouth, Ohio |
| CHAIN SAW SERVICE MANUAL | Technical Publications, Inc.<br>1014 Wyandotte Street<br>Kansas City 5, Missouri |
| CHAIN SAW SERVICE MANUAL | Implement and Tractor Pub., Inc.<br>1014 Wyandotte St.<br>Kansas City 5, Missouri |
| JOHNSON SERVICE MANUAL | Johnson Motors<br>Waukegan, Illinois |
| MASTER SERVICE MANUAL | Mercury Outboard Motors<br>Kiekhaefer Corporation<br>Beaver Dam, Wisconsin |
| OUTBOARD MOTOR AND BOATING GUIDE | Theo. Audel and Co.<br>49 West 23rd Street<br>New York 10, New York |

A detailed outline of the Small Engines Mechanics Course follows:

Introduction

Unit I - Basic Repair Skills

| | | |
|---|---|---|
| R.S.A. | 1 | Hand Tools and How to Use |
| Math | 1 | Linear Measurement |
| Math | 2 | Rule Practice |
| Job | 1 | Disassemble and Reassemble Used Engine |
| Job | 2 | Identify Hand Tools |
| Math | 3 | Addition of Rule Measurements |
| Job | 3 | Reshape screwdriver, Chisel, and Center Punch, Using Bench Grinder |
| Math | 4 | Subtraction of Rule Measurements |
| R.S.A. | 2 | Measuring Devices |
| R.S.A. | 2A | The Micrometer |
| Job | 4 | Measure Crankshaft and Cylinder With Micrometers |

Course Outline (Continued)

| | | |
|---|---|---|
| R.S.A. | 3 | Fastening Devices and Related Items (Part I) |
| Job | 5 | Identify Bolts and Nuts |
| R.S.A. | 3 | Fastening Devices and Related Items (Part II) |
| Job | 6 | Identify Retaining Rings |
| R.S.A. | 4 | Drills, Taps, and Dies |
| R.S.A. | 4A | Tools |
| Job | 7 | Make a Drill Gauge |
| Job | 8 | Make Internal Thread Block and Studs |
| R.S.A. | 5 | Installing Studs and Removing Broken Studs |
| Job | 9 | Remove a Broken Stud |
| R.S.A. | 5A | Internal Thread Repairs |
| Job | 10 | Repair Internal Threads with Inserts |
| R.S.A. | 6 | Tubing and Fittings |
| Job | 11 | Make Up Replacement Fuel Line, Using Assorted Fittings |
| Job | 12 | Repair Internal Pipe Threads With Repair Insert |
| R.S.A. | 7 | Soldering |
| Job | 13 | Splice Insulated Wire |
| Job | 14 | Make a Solder Joint |
| Job | 15 | Sweat a Tank Fitting |
| R.S.A. | 8 | Bushings and Reamers |
| Job | 16 | Remove, Replace, and Ream a Bushing |

Unit II- Engine Fundamentals

Introduction

| | | |
|---|---|---|
| R.S.A. | 1 | Theory of Operation - 2-Stroke Cycle Engines |
| Job | 1 | Disassemble and Reassemble 2-Cycle Engine |
| Math | 5 | The Decimal System |
| Math | 6 | Addition and Subtraction of Decimals |
| Job | 2 | Identify Engine Parts By Proper Name, Using Manufacturer's Parts Catalog (2-Cycle Engine) |
| R.S.A. | 2 | Theory of Operation - 4-Stroke Cycle Engines |
| Job | 3 | Disassemble and Reassemble Engine, 4-Stroke Cycle |
| Math | 7 | Multiplication and Division of Decimals |
| Job | 4 | Identify Parts by Name, 4-Cycle Engine, Using Manufacturer's Parts Catalog |
| Job | 5 | Start, Stop, and Store 2-Cycle Engine |
| Job | 6 | Start, Stop, and Store 4-Cycle Engine |
| R.S.A. | 3 | Principles and Operations of Small Gasoline Engines |

Unit III - Fuel Systems

| | | |
|---|---|---|
| R.S.A. | 1 | Fuel Supply Systems |
| Job | 1 | Remove, Repair, and Replace Carburetor, Briggs and Stratton (Updraft) |

Course Outline (Continued)

| | | |
|---|---|---|
| R.S.A. | 2 | Float Carburetors |
| Job | 2 | Remove, Repair, and Replace Carburetor (Briggs and Stratton Float Type, Sidedraft) |
| R.S.A. | 3 | Governors |
| Job | 3 | Repair and Adjust Carburetor and Governor, Clinton Vertical Shaft Engine (Carter Carburetor) |
| R.S.A. | 4 | Diaphragm Carburetors |
| Job | 4 | Repair and Adjust Carburetor and Governor, Clinton Vertical Shaft Engine (Clinton or Walbro Carburetor) |
| Job | 5 | Repair and Adjust Carburetor and Governor, Lauson Series, Walbro Carburetor |
| Job | 6 | Repair and Adjust Carburetor and Governor, Power Products, (Tillotson Carburetor) AV Series |
| Job | 7 | Repair Carburetor, Double Diaphragm, Carter Model "ND" |
| Job | 8 | Repair Single Diaphragm Carburetor, (Lauson V Series Lightweight Engine) or Power Products Engine (Tecumseh Carburetor) |
| R.S.A. | 5 | Air Cleaners |
| Job | 9 | Repair and Adjust Carburetor and Governor Lawn Boy "C" Series Engine |
| R.S.A. | 6 | Remote Control System |
| Job | 10 | Repair and Adjust Remote Control System (Craftsman Lawn Mower With Handle Mounted Dial Control) |
| Job | 11 | Install a Bowden Wire Remote Control System |

Unit IV - Magneto Ignition

| | | |
|---|---|---|
| R.S.A. | 1 | Magnetism and Electricity |
| Job | 1 | Repair Ignition System, Briggs & Stratton Aluminum Horizontal Series Engine |
| R.S.A. | 2 | Flywheel Magnetos |
| Job | 2 | Repair Ignition System, Briggs and Stratton Small Cast Iron Series |
| Job | 3 | Repair Ignition System, Briggs & Stratton "Magnematic Ignition System" |
| R.S.A. | 3 | Trouble Shooting Information |
| Job | 4 | Repair Ignition System, Clinton Vertical Shaft Aluminum Engine Series |
| Job | 5 | Repair Ignition System Clinton Vertical Shaft, Two Cycle |
| Job | 6 | Repair Ignition System, Lauson V-Series, Wico Magneto |
| R.S.A. | 4 | High Tension Magnetos |
| Job | 7 | Repair High Tension Magneto (Wico Model XH-1) (as used on Wisconsin AE, AEH, AEN Series) |

Course Outline (Continued)

| | | |
|---|---|---|
| Job | 8 | Repair High Tension Magneto (Multi-Cylinder Model as used on Wisconsin 4-Cylinder Engine) (Fairbanks Morse Type FM-X4A7B) |
| R.S.A. | 5 | Spark Plugs |

Unit V - Starting Systems

| | | |
|---|---|---|
| R.S.A. | 1 | Manual Starters |
| Job | 1 | Repair Rewind Starter, Briggs and Stratton |
| Job | 2 | Disassemble and Repair Rewind, Clinton Engine (Fairbanks Morse Starter) |
| Job | 3 | Repair Recoil Starter (Clinton Starter) |
| Job | 4 | Repair Rewind Starter, Clinton Engine (Schnake Starter) |
| Job | 5 | Repair Rewind Starter, Lawn Boy C Series Engine |
| Job | 6 | Repair Rewind Starter, Tecumseh Engine (Eaton Starter) |
| Job | 7 | Repair Wind-Up Starter, Briggs and Stratton, Vertical Shaft Engine |
| Job | 8 | Repair Wind-Up Starter, Tecumseh Engine, "Self Starter" |
| R.S.A. | 2 | Wind-Up Starters |
| Job | 9 | Repair Wind-Up Starter, Clinton "Impulse Starter" |

Unit VI - Engine Overhaul

Introduction:

| | | |
|---|---|---|
| R.S.A. | 1 | Cooling |
| Job | 1 | Clean and Inspect Air-Cooling System (Any Make) |
| R.S.A. | 2 | Valve Systems |
| Job | 2 | Reface Valves |
| Job | 3 | Remove, Replace, and Reseat Valve Seats |
| Job | 4 | Perform Valve and Seat Reconditioning Job (Briggs and Stratton Engine, Small Series, Lightweight) |
| Job | 5 | Perform Valve and Seat Reconditioning Job (Clinton Engine, Lightweight Series) |
| Job | 6 | Recondition Valve System, Tecumseh Engine (4-Cycle) |
| Job | 7 | Recondition Valve System, Wisconsin 2 or 4-Cylinder Engine |
| R.S.A. | 3 | Cylinders |
| Job | 8 | Hone Aluminum Cylinder for Oversize Piston |
| Job | 9 | Hone Cylinder For Oversize Piston (Cast Iron) |
| R.S.A. | 4 | Pistons, Rings, Pins, and Connecting Rods |
| Job | 10 | Bore Cylinder For Oversize Piston |
| Job | 11 | Remove and Replace Connecting Rod, Piston, and Piston Rings. (Briggs & Stratton Lightweight Series, Vertical Shaft Engine) |

Course Outline (Continued)

| | | |
|---|---|---|
| Job | 12 | Remove and Replace Connecting Rod and Piston Assembly, Clinton Lightweight VS Series |
| Job | 13 | Remove and Replace Connecting Rod and Piston Assembly, Tecumseh 2-Cycle, Vertical-Shaft Engine |
| R.S.A. | 5 | Camshafts, Crankshafts, Bearings and Seals |
| Job | 14 | Remove and Replace Crankshaft and Main Bearings, Tecumseh "V" Series, 4 Cycles |
| Job | 15 | Remove and Replace Crankshaft and Main Bearings, Tecumseh 2-Cycle Engine |
| R.S.A. | 6 | Oil Pumps |
| Job | 16 | Complete Engine Overhaul, Briggs and Stratton Model 8 Engine |
| Job | 17 | Complete Engine Overhaul, Clinton "V" Series Lightweight 4 Cycle |
| Job | 18 | Complete Engine Overhaul, Lawn Boy C Series |
| Job | 19 | Complete Engine Overhaul, Briggs and Stratton (Cast Iron Series, 3 HP or above) |
| Job | 20 | Complete Engine Overhaul (Wisconsin 2 or 4 Cylinder Engine) |

Unit VII - Clutches and Drive Mechanisms

| | | |
|---|---|---|
| R.S.A. | 1 | Centrifugal Clutches |
| Job | 1 | Repair Centrifugal Clutch, Drum Type |
| Job | 2 | Repair Centrifugal Clutch, Disc Type (Cushman Scooter) |
| R.S.A. | 2 | Manual Clutches |
| R.S.A. | 3 | Belt and Chain Drives |
| Job | 3 | Repair and Adjust Belt Drive Assembly |
| Job | 4 | Repair and Adjust Chain Drive Assembly |
| R.S.A. | 4 | Transmissions |
| Job | 5 | Repair Transmission |
| R.S.A. | 5 | Differentials |
| Job | 6 | Repair Differential |

Unit VIII - Grass Cutting Equipment

Introduction:

| | | |
|---|---|---|
| R.S.A. | 1 | Rotary Lawn Mowers |
| Job | 1 | Remove, Repair, and Replace Rotary Mower Blade |
| Job | 2 | Overhaul Self-Propelled Rotary Mower, Complete |
| R.S.A. | 2 | Reel Type Lawn Mowers |
| Job | 3 | Adjust Bed-Knife Clearance and Lubricate Mower |
| Job | 4 | Grind a Bed Knife and Reel |
| Job | 5 | Complete Overhaul, Reel Type Power Mower |

Course Outline (Continued)

Unit IX - Refinishing

| | | |
|---|---|---|
| R.S.A. | 1 | Painting, Refinishing, and Preparations |
| Job | 1 | Prepare a Lawn Mower for Refinishing |
| R.S.A. | 2 | Paints, Lacquers, and Thinners |
| Job | 2 | Paint a Lawn Mower with Spray Gun |

Unit X - Chain Saws

| | | |
|---|---|---|
| R.S.A. | 1 | Chain Saw Operation |
| Job | 1 | File and Adjust Chain, Any Make |
| Job | 2 | Repair Chain Saw Oiling System |
| Job | 3 | Repair Clutch |
| Job | 4 | Repair Chain Saw Transmission |
| Job | 5 | Overhaul Chain Saw, Complete |

Unit XI - Pumps

| | | |
|---|---|---|
| R.S.A. | 1 | Centrifugal and Diaphragm Pumps |
| Job | 1 | Overhaul a Centrifugal Pump |
| Job | 2 | Overhaul a Diaphragm Pump |

Unit XII - Outboard Engine Fuel Systems

| | | |
|---|---|---|
| R.S.A. | 1 | Remote Fuel-Supply Systems |
| Job | 1 | Repair Outboard Remote Fuel System |
| R.S.A. | 2 | Outboard Engine Carburetion |
| Job | 2 | Repair Carburetor, Johnson or Evinrude, 2 Cylinder (with electric choke) |
| Job | 3 | Repair and Adjust Dual Carburetors, Mercury 4 Cylinder |
| Job | 4 | Repair Two-Barrel Carburetor, Johnson or Evinrude 4 Cylinder (with automatic choke) |

Unit XIII - Outboard Engine Ignition

| | | |
|---|---|---|
| R.S.A. | 1 | Outboard Magnetos |
| Job | 1 | Repair and Synchronize Outboard Magneto, 2 Cylinder Engine |
| Job | 2 | Repair and Synchronize Outboard Magneto 4 Cylinder Engine |
| R.S.A. | 2 | Battery Ignition |
| Job | 3 | Repair Outboard Engine Battery Ignition System |

Units I - VII of the Tractor Maintenance and Repair Course was published in 1953-1954, Units VIII - XIV in 1958. It is available in the following forms:

Math, Related Study Assignments, Jobs and Job Information Sheets are all in Packages for students. Book forms are available for the Instructors.
Book I - Units I and II
Book II - Units III and IV
Book III - Units V, VI and VII
Book IV - Units VIII through XIV

Test Book
Includes all test for Units I - XIV
Answer Book
Complete for Units I - XIV

The following instructor's aids are available:
Permanent Record Folders
Wall Progress Charts

The references for the Tractor Maintenance and Repair Course are the following:

| Title | Source |
|---|---|
| Jones, Fred,<br>FARM GAS ENGINE AND TRACTORS | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Johnson,<br>SERVICING AND MAINTAINING FARM TRACTORS | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| I AND T SHOP SERVICE BOOK | Implement and Tractor Pub., Inc.<br>Graphic Arts Building<br>Kansas City 5, Missouri |
| OPERATORS MANUAL | |
| SPARK PLUG CLEANER MANUFACTURER'S SERVICE MANUAL | |
| MOTOR'S TRUCK AND TRACTOR REPAIR MANUAL | Motor<br>250 West 55th Street<br>New York |
| Delco-Remy<br>ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE HANDBOOK | Delco-Remy Division<br>General Motors<br>Anderson, Indiana |

References (Continued)

| Title | Source |
|---|---|
| MOTOR'S AUTO REPAIR MANUAL | Motor<br>250 West 55th Street<br>New York 19, New York |
| Crouse,<br>AUTOMOTIVE MECHANICS,<br>Second Edition | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| BORING BAR MANUFACTURERS MANUAL | |
| Kuns,<br>AUTO MECHANICS<br>Book One | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| A.B.C.'S OF HAND TOOLS | General Motors Corporation<br>General Motors Building<br>3044 West Grand Boulevard<br>Detroit 2, Michigan |
| Morrison, Ivan, Gregg,<br>FARM TRACTOR MAINTENANCE,<br>1946 | The Interstate Printers<br>and Publishers, Inc.<br>Jackson at Van Buren<br>Danville, Illinois |

A detailed outline of the Tractor Maintenance and Repair Course follows:

## UNIT I: PREVENTIVE MAINTENANCE FUNDAMENTALS

### PACKAGE #1

| | | |
|---|---|---|
| Math | 1 | The Steel Rule |
| R.S.A. | 1 | Fastening Devices, Calipers, and Thread Gages |
| Job | 1 | Identify Bolts and Nuts |

### PACKAGE #2

| | | |
|---|---|---|
| R.S.A. | 2 | Drills, Taps, and Dies |
| Job | 2 | Make Internal Thread Block and Studs |
| J.I.S. | 1 | Tools (For use with Job 2) |

### PACKAGE #3

| | | |
|---|---|---|
| R.S.A. | 3 | Installing Studs and Removing Broken Studs |
| Job | 3 | Remove a Broken Stud |
| Math | 2 | Addition and Subtraction of Scale Measurements |

Course Outline (Continued)

UNIT I (Continued)

PACKAGE #4

R.S.A. 4 Soldering
Job 4 Make a Solder Joint

PACKAGE #5

Job 5 Start, Operate and Stop Tractor

PACKAGE #6

R.S.A. 5 Hand Tools and How to Use
Job 6 Identify Hand Tools

PACKAGE #7

R.S.A. 6 Tire Service
Job 7 Remove, Repair, and Replace Tire and Tube

PACKAGE #8

Math 3 Addition and Subtraction of Whole Numbers
R.S.A. 7 Lubrication
Job 8 Lubricate Tractor

PACKAGE #9

R.S.A. 8 Lubricating Oils and Oil Filters
Job 9 Drain, Flush, Refill Crankcase and Service Oil Filter

PACKAGE #10

R.S.A. 9 Battery Service
Job 10 Service a Battery

PACKAGE #11

R.S.A. 10 Cooling Systems
Job 11 Flush Cooling System

UNIT II: FRONT AXLE AND STEERING GEAR

PACKAGE #12

R.S.A. 11 Front Wheel Service
Job 12 Remove, Repack, and Adjust Front Wheel Bearings
Math 4 Multiplication of Whole Numbers

Course Outline (Continued)

UNIT II (Continued)

PACKAGE #13

| | | |
|---|---|---|
| R.S.A. | 12 | Front Axles |
| Job | 13-B | Set Toe-In (Ford, 8N) |
| Job | 13-C & E | Set Toe-In (Farmall, Super-A and Case, LA) |
| Math | 5 | Division of Whole Numbers |

PACKAGE #14

| | | |
|---|---|---|
| R.S.A. | 13 | Reamers and Reaming |
| Job | 14-B | Renew Spindle Bushings (Ford, 8N) |
| Job | 14-C | Rebush Steering Knuckles (Farmall, Super-A) |
| Job | 14-E | Renew Kingpin Bushings (Case, LA) |
| Job | 15-B | Renew Axle Pin Bushing (Ford, 8N) |
| Job | 15-C | Renew Axle Pivot Shaft Bushings (Farmall Super-A) |
| Job | 15-E | Renew Axle Pivot Shaft Bushing (Case L.A.) |
| Math | 6 | Changing Fractions |

PACKAGE #15

| | | |
|---|---|---|
| Job | 16-A | Renew Vertical Spindle Bushing (John Deere-B) |
| Job | 17-A | Repair Roll-O-Matic (John Deere-B) |
| Job | 18-D | Renew Front Wheel Felt Washers (Allis-Chalmer, W.C.) |
| R.S.A. | 14 | Steering Gears and Adjustment |
| Job | 19-A | Adjust Steering Gear (John Deere-B) |

PACKAGE #16

| | | |
|---|---|---|
| Job | 19-B | Adjust Steering Gear (Ford, 8N) |
| Job | 19-D | Adjust Steering Gear (Allis-Chalmers, W.C.) |
| Job | 19-E | Adjust Steering Gear (Case, LA) |
| R.S.A. | 15 | Tie Rod Ends and Universal Joints |
| Job | 20-B | Overhaul Steering Gear (Ford, 8N) |
| Job | 20-C | Overhaul Steering Gear (Farmall, Super-A) |
| Job | 20-E | Overhaul Steering Gear (Case, LA) |

Unit III: Cooling System

PACKAGE #17

| | | |
|---|---|---|
| R.S.A. | 16 | Radiators and Radiator Service |
| Math | 7 | Addition and Subtraction of Fractions |
| Job | 21 | Remove and Repair Radiator |

PACKAGE #18

| | | |
|---|---|---|
| R.S.A. | 17 | Fans and Fan Drives |
| Math | 8 | Multiplication of Fractions |
| Job | 22-A | Repair Fan Assembly (John Deere-B)<br>(Hood and Radiator Removed) |

Course Outline (Continued)

## UNIT III (Continued)

### PACKAGE #18 (Continued)

| | |
|---|---|
| Job 22-C | Repair Fan Assembly (Farmall Super-A) |
| Job 23-A | Check and Repair Ventilator Pump (John Deere-B) (Fan Assembly Removed) |

### PACKAGE #19

| | |
|---|---|
| Math 9 | Division of Fractions |
| R.S.A. 18 | Water Pumps |
| Job 24-B | Remove, Repair, and Replace Water Pump(Ford 8N) |
| Job 24-D | Remove, Repair, and Replace Water Pump (Allis-Chalmer WC) |
| Job 24-E | Remove, Repair, and Replace Water Pump (Case LA) |

### PACKAGE #20

| | |
|---|---|
| R.S.A. 19 | Thermostats, Shutters, and Temperature Gages |
| Job 25 | Remove, Check, and Replace Thermostat (Radiator Drained) |

## UNIT IV: ATTACHMENTS

### PACKAGE #21

| | |
|---|---|
| R.S.A. 20 | Power Take-offs and Drawbars |
| Job 26-C | Remove, Repair, and Replace Power Take-Off (Farmall, Super-A) (To be performed with Job No. 27-C) |
| Job 26-D | Remove, Repair, and Replace Power Take-Off (Allis-Chalmers W.C.) |
| Job 26-E | Remove, Repair, and Replace Power Take-Off (Case LA) |

### PACKAGE #22

| | |
|---|---|
| Math 10 | Pulley Speeds and Sizes |
| R.S.A. 21 | Belt Pulleys and Pulley Speeds |
| Job 27-B | Remove, Repair, and Replace Belt Pulley (Ford 8N) |
| Job 27-C | Remove, Repair, and Replace Belt Pulley (Farmall, Super-A) (To be performed with Job No. 26-C) |
| Job 27-D | Remove, Repair, and Replace Belt Pulley (Allis-Chalmers W.C.) |

Course Outline (Continued)

UNIT IV: (Continued)

PACKAGE #23

| | | |
|---|---|---|
| Math | 11 | The Decimal System |
| R.S.A. | 22 | Lighting Systems, Lights and Light Switches |
| Job | 28-A | Install Lighting Attachment (John Deere-B) |
| Job | 28-B | Install Lighting System (Ford 8N) |
| Job | 28-C | Install Lighting System (Farmall, Super-A) |
| Job | 28-D | Install Lighting System (Allis-Chalmers, W.C.) |
| Job | 28-E | Install Lighting System (Case, LA) |

PACKAGE #24

| | | |
|---|---|---|
| Math | 12 | Addition and Subtraction of Decimal Fractions |
| R.S.A. | 23 | Basic Hydraulic Principles and General Power Lift Operation |
| R.S.A. | 23-A | Powr-Trol and Power Lift (John Deere, B)* |
| R.S.A. | 23-B | Hydraulic Control (Ford 8N) |
| R.S.A. | 23-C | Touch-Control (Ford 8N) |
| R.S.A. | 23-E | Hydraulic Control Unit (Case L.A.) |
| Job | 26-B | Remove and Repair Power Take-Off Shaft (Ford 8N) |
| Job | 29-A | Repair Powr-Trol (John Deere-B) |
| Job | 29-B | Remove, Repair, and Replace Hydraulic Control (Ford, 8N) |
| Job | 29-C | Remove, Repair, and Replace Touch Control (Farmall, Super-A) |
| Job | 29-D | Remove, Repair, and Replace Mechanical Lift (Allis-Chalmers, W.C.) |
| Job | 29-E | Remove, Repair, and Replace Hydraulic Control Unit (Case, LA) |

UNIT V: REAR AXLE, FINAL DRIVE, AND BRAKES

PACKAGE #25

| | | |
|---|---|---|
| Math | 13 | Multiplication of Decimal Fractions |
| R.S.A. | 24 | Bearings, Seals and Closures |
| Job | 30-C | Remove, Repair and Reassemble Final Drive (Farmall, Super-A) |
| Job | 30-D | Disassemble, Repair, and Reassemble Final Drive (Allis-Chalmers, WC) |
| R.S.A. | 25 | Tractor Final Drives |
| Job | 33-D | Remove, Repair, and Replace Brakes (Allis Chalmers W.C.) (Final Drive Disassembled) |

PACKAGE #26

| | | |
|---|---|---|
| R.S.A. | 26 | Types of Rear Axles and Their Adjustments |
| Job | 31-A | Remove and Renew Rear Axle Bearings or Seals (John Deere-B) |

## Course Outline (Continued)

## UNIT V (Continued)

### PACKAGE #26 (Continued)

| | |
|---|---|
| Job 31-B | Remove and Renew Rear Axle Bearings or Seals (Ford 8N) |
| Job 31-E | Remove and Renew Rear Axle Bearings or Seals (Case, LA) |

### PACKAGE #27

| | |
|---|---|
| Math 14 | Division of Decimals |
| R.S.A. 27 | Brakes |
| Job 32-A | Adjust Brakes (John Deere-B) |
| Job 32-B | Adjust Brakes (Ford 8N) |
| Job 32-C | Adjust Brakes (Farmall, Super-A) |
| Job 32-D | Adjust Brakes (Allis Chalmers, WC) |
| Job 32-E | Adjust Brakes (Case, LA) (Mechanical-Internal Expanding) |
| Job 32-E | Adjust Hydraulic Brakes (Case, LA) (Minor Adjustment) |
| Job 32-E | Adjust Hydraulic Brakes (Case, LA) (Major Adjustment) |
| Job 32-X | Adjust Disc Type Brakes (All Models) |
| Job 33-A | Remove, Repair, and Replace Brakes (John Deere-B) |
| Job 33-B | Disassemble, Repair and Reassemble Brakes (Ford 8N) (Wheel and Brake Drum Removed) |
| Job 33-E | Remove, Repair, and Replace Brakes (Case, LA) |
| Job 33-E | Disassemble, Repair, and Reassemble Brakes (Case,LA) (Hydraulic Brakes) |
| Job 33-X | Remove, Repair, and Replace Disc Brakes (All Models) |

## UNIT VI: DIFFERENTIAL

### PACKAGE #28

| | |
|---|---|
| Math 15 | Changing Common Fractions to Decimals |
| Math 16 | The Micrometer |
| R.S.A. 28 | Ring Gear and Pinion Adjustments |
| Job 34-C | Adjust Ring Gear and Pinion (Farmall, Super-A) (Final Drive Removed) |
| Job 34-D | Adjust Ring Gear Backlash (Allis-Chalmers, WC) |
| R.S.A. 29 | Differential Construction and Operation |
| Job 35-A | Remove, Repair, and Reassemble Differential (John Deere-B) |
| Job 35-B | Remove, Repair, and Reassemble Differential (Ford, 8-N) |
| Job 35-C | Remove, Repair, and Reassemble Differential (Farmall, Super-A) |
| Job 35-D | Remove, Repair and Reassemble Differential (Allis Chalmers, WC.) |
| Job 35-E | Remove, Repair, and Reassemble Differential (Case, LA.) (To be performed with Jobs 37-E and 38-E) |

Course Outline (Continued)

UNIT VI (Continued)

PACKAGE #28 (Continued)

| | |
|---|---|
| Job 36-D | Disassemble, Repair, and Reassemble Torque Tube (Allis-Chalmers, WC.) |
| R.S.A. 30 | Getting and Holding a Job |

## UNIT VII: TRANSMISSIONS

PACKAGE #29

| | |
|---|---|
| R.S.A. 31 | Transmission Shifter Mechanism |
| Job 37-A1 | Disassemble, Repair, and Reassemble Shifter Mechanism (John Deere-B) (Differential Removed) (Serial No. B-9600 to B-201000) |
| Job 37-A2 | Disassemble, Repair, and Reassemble Shifter Mechanism (John Deere-B) (Differential Removed) (Serial No. B-201000 and Up) |
| Job 37-B | Disassemble, Repair, and Reassemble Shifter Mechanism (Ford, 8-N) (Differential Removed) |
| Job 37-C | Remove, Repair, and Replace Shifter Mechanism (Farmall, Super-A) |
| Job 37-D | Remove, Repair, and Replace Shifter Mechanism (Allis-Chalmers, WC.) |
| Job 37-E | Repair and Replace Shifter Mechanism (Case, LA.) (Differential Removed) |

PACKAGE #30

| | | |
|---|---|---|
| Math | 17 | Gear Ratios |
| R.S.A. | 32 | Transmissions |
| R.S.A. | 32-A1 | Transmission Construction and Operation (John Deere-B, Serial No. B-96000 to B-201000) |
| Job | 38-A1 | Disassemble, Repair, and Reassemble Transmission (John Deere-B) (Differential and Shifter Mechanism Removed) (Serial No. B-96000 to B-201000) |
| R.S.A. | 32-A2 | Transmission Construction and Operation (John Deere-B, Serial No. B-201000 and up) |
| Job | 38-A2 | Disassemble, Repair, and Reassemble Transmission (John Deere-B Serial No. B-201000 and up) (Differential and Shifter Mechanism) |
| R.S.A. | 32-B | Transmission Construction and Operation (Ford, 8-N) |
| Job | 38-B | Disassemble, Repair, and Reassemble Transmission (Ford, 8-N) (To be Performed with Job No. 37-B) |
| Job | 38-C | Disassemble, Repair, and Reassemble Transmission (Farmall, Super A.) (Differential Removed) |
| Job | 38-D | Remove, Repair, and Replace Transmission (Allis-Chalmers, W.C.) (Differential and Torque Tube Removed) |
| Job | 38-E | Disassemble, Repair, and Reassemble Transmission (Case, LA) (Differential and Shifter Mechanism Removed) |

Course Outline (Continued)

## UNIT VIII: CLUTCHES

### PACKAGE #31

| | |
|---|---|
| R.S.A. 33 | Types of Clutches; Care and Operation |
| Math 18 | Simple Percentage |
| Job 39-A | Repair and Adjust Clutch, Farmall A, B, or C |
| Job 39-B | Repair and Adjust Clutch, Allis-Chalmers WD |
| Job 39-C | Repair and Adjust Clutch, Ford 8N |
| Job 39-D | Repair and Adjust Clutch, John Deere B |

## UNIT IX: FUEL SYSTEMS

### PACKAGE #32

| | |
|---|---|
| R.S.A. 34 | Fuel Supply and Carburetion Systems |
| Job 40-A | Remove, Repair, and Replace Carburetor, Farmall A, B, or C |
| Job 40-B | Remove, Repair, and Replace Carburetor, Allis-Chalmers WD. |
| Job 40-C | Remove, Repair, and Replace Carburetor, Ford 8N |
| Job 40-D | Remove, Repair, and Replace Carburetor, John Deere B |

### PACKAGE #33

| | |
|---|---|
| R.S.A. 35 | Governors, Types and Operation |
| Math 19 | Discount |
| Job 41-A | Remove, Repair, and Replace Governor, Farmall A, B, or C |
| Job 41-B | Remove, Repair, and Replace Governor, Allis-Chalmers WD |
| Job 41-C | Remove, Repair, and Replace Governor, Ford 8N |
| Job 41-D | Remove, Repair, and Replace Governor, John Deere B |

## UNIT X: MAGNETO IGNITION

### PACKAGE #34

| | |
|---|---|
| R.S.A. 36 | Magnetism and Electricity |
| R.S.A. 37 | Magneto Construction and Operation |
| Job 42-A | Disassemble, Repair and Reassemble Magneto, Farmall A, B, or C |

### PACKAGE #35

| | |
|---|---|
| R.S.A. 38 | Impulse-Starter Couplings; Timing and Care of the High-Tension Magneto |
| Math 20 | Personal Checks and Drafts |
| Job 42-B | Disassemble, Repair and Reassemble Magneto, Allis-Chalmers WD |
| Job 42-C | Disassemble, Repair and Reassemble Magneto, (John Deere B) |

Course Outline (Continued)

## UNIT XI: BATTERY IGNITION

### PACKAGE #36

| | | |
|---|---|---|
| R.S.A. | 39 | Types and Requirements of Battery Ignition Systems |
| Job | 43-A | Disassemble, Repair, and Reassemble Distributor, Farmall A, B, or C. |
| Job | 43-B | Disassemble, Repair, and Reassemble Distributor, Allis-Chalmers WD |

### PACKAGE #37

| | | |
|---|---|---|
| R.S.A. | 40 | Coils, Condensers, Contact Points, Distributor, and Spark Plugs |
| Job | 43-C | Disassemble, Repair and Reassemble Face Mounted Distributor, Ford 8N |
| Job | 43-D | Disassemble, Repair, and Reassemble Angle Mounted Distributor, Ford 8N |
| Job | 43-E | Remove, Clean, Adjust and Replace Spark Plugs |

## UNIT XII: CRANKING MOTORS

### PACKAGE #38

| | | |
|---|---|---|
| R.S.A. | 41 | Operating Principles of Cranking Motors and Drivers |
| Math | 21 | Work Orders and Bills |
| Job | 44 | Remove, Overhaul, and Replace Cranking Motor |

## UNIT XIII:

### PACKAGE #39

| | | |
|---|---|---|
| R.S.A. | 42 | Generator Construction and Operation |
| Job | 45 | Remove, Disassemble, Repair and Replace a Generator |

### PACKAGE #40

| | | |
|---|---|---|
| R.S.A. | 43 | Cutout Relays and Step-voltage Controls |
| Math | 22 | Keeping Accounts |
| Job | 46 | Remove, Check, and Adjust Step-voltage Control |

## UNIT XIV: ENGINES

### PACKAGE #41

| | | |
|---|---|---|
| R.S A. | 44 | Engine Fundamentals |
| Job | 47 | Clean Engine With Cold or Hot Degreasing Solution |
| Job | 48 | Remove and Replace Expansion Plug |

Course Outline (Continued)

PACKAGE #42

| | | |
|---|---|---|
| R.S.A. | 45 | Valve Types and Construction |
| R.S.A. | 46 | Valve Mechanisms |
| Job | 49 | Reface Rocker Arms |

PACKAGE #43

| | | |
|---|---|---|
| R.S.A. | 47 | Valve Service |
| Job | 50 | Remove, Clean, and Replace Rocker Arms |
| Job | 51 | Grind Valves on I-Head Engine |
| Job | 52 | Grind Valves on L-Head Engine |

PACKAGE #44

| | | |
|---|---|---|
| R.S.A. | 48 | Pistons, Piston Rings, Cylinders and Sleeves |
| Job | 58 | Remove Old and Install New Piston Rings |
| Job | 59 | Remove Old and Install New Cylinder Sleeves, Dry Type |
| Job | 60 | Remove and Install Cylinder Sleeve, Wet Type |
| Job | 61 | Rebore Cylinder |
| Job | 62 | Hone Cylinder and Fit Piston |

PACKAGE #45

| | | |
|---|---|---|
| R.S.A. | 49 | Piston Pins and Bushings, Connecting Rods, Crankshaft and Main Bearings |
| Job | 53 | Remove Old and Fit New Piston Pins and Bushings |
| Job | 54 | Install New Ring Gear on Flywheel |
| Job | 55 | Adjust Connecting Rod Bearings with Engine in Tractor, John Deere (Shim Type) |
| Job | 56 | Install New Connecting Rod Bearings With Engine in Tractor (Insert Type) |
| Job | 57 | Adjust Main Bearings, John Deere B |

PACKAGE #46

| | | |
|---|---|---|
| R.S.A. | 50 | Engine Lubrication Systems |
| Job | 63 | Remove, Inspect, and Replace Oil Pump |

PACKAGE #47

| | | |
|---|---|---|
| Job | 64 | Overhaul Engine Completely (Except John Deere) |

PACKAGE #48

| | | |
|---|---|---|
| Job | 65 | Overhaul Engine Completely, John Deere B |

The Vocational-Technical Drawing Course was written in 1964-65. It is available in book form for the instructors and in loose form for distribution to students. There are twenty-two units of Related Study Assignments and Jobs with accompanying tests and answers.

| | | |
|---|---|---|
| Unit | I | Introduction and Orientation |
| RSA | 1 | History of the Occupation |
| RSA | 2 | The Draftsman and Specialization |
| RSA | 3 | Drafting Instruments and Materials |
| RSA | 4 | Nature of the Work and Employment Outlook |
| RSA | 5 | How to Use Instructional Material |
| Unit | II | Lettering |
| RSA | 1 | Sheet Layout |
| Math | 1 | Common Fractions |
| Job | 1 | Draw Horizontal and Vertical Lines |
| RSA | 2 | Lettering - Vertical Caps - The Straight Line Group |
| Math | 2 | Partitive Fractions |
| Job | 2 | Practice Free-Hand Lettering - The Straight Line Group |
| RSA | 3 | The Circle Group |
| Math | 3 | Equivalent Fractions and the Golden Rule |
| Job | 3 | Practice Free-Hand Lettering, The Circle Group |
| RSA | 4 | Lettering - Numerals and Fractions |
| Math | 4 | Reduction of Common Fractions |
| Job | 4 | Practice Lettering Numerals and Fractions |
| RSA | 5 | Lower Case Letters |
| Math | 5 | Reduction of Improper Fractions |
| Job | 5 | Practice Lower Case Letters |
| RSA | 6 | Inclined Lettering |
| Math | 6 | Writing a Mixed Number as a Fraction |
| Job | 6 | Practice Inclined Lettering |
| RSA | 7 | Lettering - Proportion, Stability, Size and Spacing |
| Math | 7 | Like and Unlike Fractions |
| Job | 7 | Lettering - Practice Proportion, Size and Spacing |
| RSA | 8 | Compression and Extension |
| Math | 8 | Addition of Fractions |
| Job | 8 | Practice Compression and Extension |
| RSA | 9 | Lettering - Notes and Titles |
| Math | 9 | Substraction of Fractions |
| Job | 9 | Letter Notes and Titles |
| RSA | 10 | Lettering Styles for Architectural Draftsmen |
| Math | 10 | Multiplication of Fractions |
| Job | 10 | Practice Letter Styles |
| RSA | 11 | Review of Unit II |
| Math | 11 | Division of Fractions |
| Job | 11 | Review Lettering |

Course Outline (Continued)

| | | |
|---|---|---|
| Unit III | | Geometric Construction |
| RSA | 1 | Geometric Construction - Straight Lines |
| Math | 1 | Circle Circumference |
| Job | 1 | Geometric Construction |
| RSA | 2 | The Circle |
| Math | 2 | Circle Diameters and Radii |
| Job | 2 | Construct Circles and Center Lines |
| RSA | 3 | Geometric Construction - Circles |
| Math | 3 | Area of Circles, Sectors and Segments |
| Job | 3 | Geometric Construction - Circles |
| RSA | 4 | Geometric Construction - Arcs |
| Math | 4 | Square Areas |
| Job | 4 | Geometric Construction - Fillets and Rounds |
| RSA | 5 | Geometric Construction - Arcs Tangent to Arcs and Circles |
| Math | 5 | Areas |
| Job | 5 | Geometric Construction - An exterior Arc Tangent to a Circle and a Straight Line |
| RSA | 6 | Geometric Construction - The Reverse or Ogee Curve |
| Math | 6 | Areas - Area of Transportation |
| Job | 6 | Geometric Construction - Construct a Reverse or Ogee Curve |
| RSA | 7 | Geometric Construction - Plane Figures |
| Math | 7 | Area of Triangles |
| Job | 7 | Geometric Construction - Plane Figures |
| RSA | 8 | Geometric Construction - Plane Figures, the Hexagon and Octagon |
| Math | 8 | Area of Polygons |
| Job | 8 | Geometric Construction - Hexagons |
| RSA | 9 | Geometric Construction - The Ellipse and its Straight Line Tangents |
| Math | 9 | Areas - Area of Ellipses |
| Job | 9 | Geometric Construction - Construct a Parabola |
| RSA | 10 | Geometric Construction - Parabolas |
| Math | 10 | Areas - Area of a Parabola |
| Job | 10 | Geometric Construction - Construct a Parabola |

| | | |
|---|---|---|
| Unit IV | | Dimensioning |
| RSA | 1 | Dimensioning - Line Conventions |
| Math | 1 | Decimal Fractions - Using Conversion Table |
| Job | 1 | Dimensioning - Line Conventions |
| RSA | 2 | Dimensioning - Rectangles |
| Math | 2 | Decimal Fractions - Meaning of Decimal Fractions |
| Job | 2 | Dimensioning - Rectangles |
| RSA | 3 | Dimensioning - Size and Location |
| Math | 3 | Decimals - Reduction to Lower Terms |
| RSA | 4 | Dimensioning - Circles, Arcs and Curves - Size and Location Dimensions |

Unit IV Dimensioning
(Continued)

| | | |
|---|---|---|
| Math | 4 | Decimal Fractions - Addition |
| Job | 4 | Dimensioning - Circles, Arcs and Curves |
| RSA | 5 | Dimensioning - Angles |
| Math | 5 | Decimal Fractions - Subtraction |
| Job | 5 | Dimensioning - Angles |
| RSA | 6 | Dimensioning - Counterbored and Countersunk Holes, Chamfers and Keyways |
| Math | 6 | Decimal Fractions - Multiplication |
| Job | 6 | Dimensioning - Holes, Chamfers and Keyways |
| RSA | 7 | Dimensioning - Conical Tapers, Flat Tapers and Machine Tapers |
| Math | 7 | Decimal Fractions - Division of Decimals by Whole Numbers |
| Job | 7 | Dimensioning Tapers |
| RSA | 8 | Dimensioning - Tolerances |
| Math | 8 | Decimal Fractions - Division by a Decimal |
| Job | 8 | Dimensioning - Tolerances |

Unit V Single View Drawings

| | | |
|---|---|---|
| RSA | 1 | Single View Drawings |
| Job | 1 | Single View Drawing - Rectangular Combinations |
| RSA | 2 | Single View Drawings - Laying out the Drawing |
| Job | 2 | Single View Drawings - Angular Surfaces |
| RSA | 3 | Single View Drawings - Order of Pencilling |
| Job | 3 | Single View Drawings - Circles and Arcs |
| RSA | 4 | Single View Drawings - Finished Drawings |
| Job | 4 | Single View Drawings - Construct a Finished Drawing |
| Job | 5 | Single View Drawings - Reverse Curves and Circles Tangent |
| Job | 6 | Single View Drawings - Elliptical Shapes |
| Job | 7 | Single View Drawings - Parabolic Curves |

Unit VI Multi-View Drawings

| | | |
|---|---|---|
| RSA | 1 | Theory of Visualization of the Three Principal Views |
| Job | 1-15 | Multi-View Drawings - Surface Identification |
| RSA | 2 | Multi-View Drawings - Laying Out the Front and Top Views |
| Job | 16 | Multi-View Drawings - Lay Out and Draw Front and Top Views |
| RSA | 3 | Multi-View Drawings - Laying Out The Right-Side View |
| Job | 17 | Multi-View Drawings - Laying Out the Right-Side View Using 45° Miter Method |
| Job | 18 | Multi-View Drawings - Laying Out the Right-Side View, Using Radial Point Method |
| RSA | 4 | Multi-View Drawings - Invisible Surfaces - Technique of Hidden Lines |

Unit VI Multi-View Drawings
(Continued)

| | | |
|---|---|---|
| Job | 19 | Multi-View Drawings - Hidden-Line Technique |
| RSA | 5 | Multi-View Drawings - Tangent Surfaces |
| Job | 20 | Multi-View Drawings - Tangent Surfaces |
| RSA | 6 | Multi-View Drawings - Fillets, Rounds and Runouts |
| Job | 21 | Multi-View Drawings - Fillets, Rounds and Runouts |
| RSA | 7 | Multi-View Drawings - Projection of Inclined Surfaces and Oblique Surfaces |
| Job | 22-30 | Multi-View Drawing - Projection of Inclined Surfaces and Oblique Surfaces |
| RSA | 8 | Multi-View Drawing - Left Side, Back and Bottom Views |
| Job | 31 | Multi-View Drawings -- Projecting the Left-Side View |
| Job | 32-35 | Orthographic Views From Pictorials |

Unit VII Auxiliary Views

| | | |
|---|---|---|
| RSA | 1 | Auxiliary Views - Use of Arcs for Projecting Auxiliaries |
| Job | 1 | Construct Auxiliary by Using Arcs |
| RSA | 2 | Auxiliary Views - The Reference Plane Against the Front Surface |
| Job | 2 | Construct an Auxiliary by Use of a Reference Line |
| RSA | 3 | Auxiliary Views - The Reference Plane Against an Inner Surface |
| Job | 3 | Reference Line on Inner Surface |
| RSA | 4 | Auxiliary Views - The Reference Plane as a Center Line |
| Job | 4 | The Reference Plane and the Center Line |
| RSA | 5 | Auxiliary Views - Circular and Curved Inclined Surfaces |
| Job | 5 | Auxiliary Views - Completion of Principal Views by Auxiliary--Circles and Curves |
| RSA | 6 | Auxiliary Views - Oblique Surfaces |
| Job | 6 | Auxiliary Views - Completion of Principal Views by Auxiliary--Circles and Curves |
| Job | 7-8 | Auxiliary Views - Oblique Surfaces |
| Job | 9-12 | Auxiliary Views - Additional Problems |

Unit VIII Sectional Views

| | | |
|---|---|---|
| RSA | 1 | Sectional Views - Usage and Symbols |
| Job | 1 | Sectional Views - Usage and Symbols |
| RSA | 2 | The Cutting Plane and Full Sections |
| Job | 2 | Sectional Views - The Cutting Plane |
| RSA | 3 | Sectional Views - Half Sections |
| Job | 3 | Sectional Views - Half Sections |

Unit VIII Sectional Views
(Continued)

| | | |
|---|---|---|
| RSA | 4 | Sectional Views - Offset Sections, Location and Lines Behind the Cutting Plane |
| Job | 4 | Sectional Views - Offset |
| RSA | 5 | Sectional Views - Broken-Out and Revolved Sections |
| Job | 5 | Sectional Views - Broken-Out Sections |
| Job | 6 | Sectional Views - Revolved Sections |
| RSA | 6 | Removed, Auxiliary and Thin Sections |
| Job | 7 | Sectional Views - Removed Sections |
| Job | 8 | Sectional Views - Auxiliary Sections |
| Job | 9 | Sectional Drawings - Thin Sections |
| RSA | 7 | Miscellaneous Section Rules |
| Job | 10 | Sectional Views - Web or Rib Sections |
| Job | 11 | Sectional Views - Sections Through Shafts, Bolts, Bearings, etc. |
| Job | 12-14 | Sectional Views - Additional Jobs |

Unit IX Precision Dimensioning and Tolerancing

| | | |
|---|---|---|
| RSA | 1 | Precision Dimensioning and Tolerancing - Decimal Dimensioning System |
| Job | 1 | Precision Dimensioning and Tolerancing - Decimal Dimensioning |
| Job | 2 | Precision Dimensioning and Tolerancing - Conversion Tables |
| RSA | 2 | Precision Dimensioning and Tolerancing - Basic Rules Governing Decimal Dimensioning |
| Job | 3 | Precision Dimensioning and Tolerancing - Basic Rules Governing Decimal Dimensioning |
| RSA | 3 | Precision Dimensioning and Tolerancing - Limits |
| Job | 4 | Precision Dimensioning and Tolerances |
| RSA | 4 | Precision Dimensioning and Tolerancing - Form Tolerances |
| Job | 5 | Precision Dimensioning and Tolerancing - Form Tolerances |
| RSA | 5 | Precision Dimensioning and Tolerancing - Position Tolerancing |
| Job | 6 | Precision and Limit Dimensioning - Position Tolerancing |
| RSA | 6 | Precision Dimensioning and Tolerancing - Surface Finishes |

Unit X Screw Threads and Fasteners

| | | |
|---|---|---|
| RSA | 1 | Terminology |
| Job | 1 | Screw Threads and Fasteners - Terminology |
| RSA | 2 | Detailed Representation of American Standard V-Thread |
| Job | 2 | Screw Threads and Fasteners - Detailed Representation, American Standard V-Thread |

### Unit X Screw Threads and Fasteners (Continued)

| | | |
|---|---|---|
| RSA | 3 | Detailed Representation of Miscellaneous Threads Square and Acme Threads |
| Job | 3 | Screw Threads and Fasteners - Square Threads |
| Job | 4 | Screw Threads and Fasteners - The Acme Thread |
| RSA | 4 | Thread Symbols - Schematic and Simplified |
| Job | 5 | Screw Threads and Fasteners - Schematic and Simplified Representation |
| RSA | 5 | Thread Series and Classes |
| Job | 6 | Screw Threads and Fasteners - Use Screw Thread Tables |
| RSA | 6 | Specifying and Dimensioning |
| Job | 7-8 | Screw Threads and Fasteners - Specifying and Dimensioning |
| RSA | 7 | Bolts, Screws, Rivets and Miscellaneous |

### Unit XI Gears and Cams

| | | |
|---|---|---|
| RSA | 1 | Gears and Cams - Machines Force and Motion |
| Math | 1 | Ratio |
| RSA | 2 | Gears and Cams - Gear Terminology |
| Math | 2 | Proportion |
| Job | 1 | Gears and Cams - Gear Terminology |
| Job | 2 | Gears and Cams - Construct a Spur Gear by Circular Arc Methods |
| RSA | 3 | Gears and Cams - Spur Gears |
| Math | 3 | Calculating Gear Dimensions |
| Job | 3 | Gears and Cams - Construct a Spur Gear by Circular Arc Methods |
| RSA | 4 | Gears and Cams - Rack Gear |
| Math | 4 | Calculating Gear Dimensions |
| Job | 4 | Gears and Cams - Construct a Rack Gear |
| RSA | 5 | Gears and Cams - Internal, Bevel, Worm and Helical Gears |
| RSA | 6 | Gears and Cams - Cam Layout |
| Job | 5 | Gears and Cams - Lay Out A Cam |

### Unit XII Pictorial Drawings

| | | |
|---|---|---|
| RSA | 1 | Pictorial Drawings - Types and Usage |
| RSA | 2 | Pictorial Drawings - Isometric Projection |
| Job | 1-10 | Pictorial Drawing - Construct an Isometric Drawing |
| RSA | 3 | Pictorial Drawing - Dimetric Drawing |
| Job | 11-15 | Pictorial Drawing - Construct A Dimetric Drawing |
| RSA | 4 | Pictorial Drawing - Cavalier Drawings |
| Job | 16 | Pictorial Drawings - Construct a Cavalier Drawing |
| RSA | 5 | Pictorial Drawings - Cabinet Drawings |

Unit XII Pictorial Drawings
(Continued)

| | | |
|---|---|---|
| Job | 17 | Pictorial Drawing - Construct a Cabinet Drawing |
| Job | 18 | Pictorial Drawings - Construct a General Oblique Drawing |
| RSA | 6 | Pictorial Drawings - General Oblique |
| RSA | 7 | Pictorial Drawing - Perspective Drawing |
| Job | 19 | Pictorial Drawing - Construct a One-Point Perspective |
| Job | 20 | Pictorial Drawing - Construct a Two-Point Perspective |

Unit XIII Technical Sketching

| | | |
|---|---|---|
| RSA | 1 | Technical Sketching - Application and Technique |
| Job | 1-4 | Technical Sketching - Sketch Straight Lines |
| RSA | 2 | Technical Sketching - Circles and Arcs |
| Job | 5-6 | Technical Sketching - Sketching Circles and Arcs |
| Job | 7 | Technical Sketching - Sketch Elliptical Shapes |
| Job | 8 | Technical Sketching - Sketch an Irregular Curve |
| RSA | 3 | Technical Sketching - Pictorial Sketching |
| Job | 9-11 | Technical Sketching - Isometric Sketching |
| Job | 12 | Technical Sketching - Oblique Sketching |
| Job | 13 | Technical Sketching - Cabinet Sketching |
| Job | 14 | Technical Sketching - Sketch a One-Point Perspective |
| Job | 15 | Technical Sketching - Sketch a Two Point Perspective |

Unit XIV Welding Drawings

| | | |
|---|---|---|
| RSA | 1 | Welding Drawings - Welding Processes - Arc Welding |
| Job | 1 | Welding Drawings |
| RSA | 2 | Welding Drawings - Resistance Welding |
| Job | 2 | Welding Drawings - Resistance Projection Weld Symbols |
| Job | 3-4 | Welding Drawings - Resistance Projection Weld Symbols |
| Job | 5 | Welding Drawings - Resistance - Seam Welding Symbols |
| Job | 6 | Welding Drawings - Flash and Upset Welding Symbols |
| RSA | 3 | Welding Drawings - Welding Applications |
| Job | 7 | Welding Drawings - Symbols for Built up Surfaces |
| Job | 8 | Welding Drawings - Fillet Welding Symbols |
| Job | 9 | Welding Drawings - Intermittent Welding Symbols |
| Job | 10 | Welding Drawings - Location and Extent of Fillet Welds |
| Job | 11 | Welding Drawings - Groove Welds |
| Job | 12 | Welding Drawings - Size and Root Penetration of Welds |

Unit XV Architectural Drawings
RSA 1 Architectural Drawings - Reading Architectural Drawings
RSA 2 Architectural Drawings - Elements of Construction Drawings - Preliminary Planning
Job 1 Architectural Drawing - Preliminary Planning
RSA 3 Architectural Drawing - Wood Frame Floor Plans and Symbols
Job 2 Architectural Drawing - Wood Frame Floor Plans and Symbols
RSA 4 Architectural Drawing - Foundation Plans
Job 3 Architectural Drawing - Foundation Plans
RSA 5 Architectural Drawing - Brick Veneer Floor Plans and Architectural Symbols
Job 4 Architectural Drawing - Brick Veneer Floor Plans
RSA 6 Architectural Drawing - Wall and Roof Sections
Job 5 Architectural Drawing - Wall and Roof Sections
RSA 7 Architectural Drawing - Window and Door Details and Schedules
Job 6 Architectural Drawing - Detail a Double Hung Window in Wood Frame
Job 7 Architectural Drawing - Detail a D. H. Window in Brick Veneer
Job 8 Architectural Drawing - Detail a Door in a Wood Frame
Job 9 Architectural Drawing - Detail a Door in Brick Veneer
RSA 8 Architectural Drawing - Elevations
Job 10 Architectural Drawing - Elevations
RSA 9 Architectural Drawing - Roof and Cornice Details
Job 11 Architectural Drawing - Gable Roof
Job 12 Architectural Drawing - Cornice Details
Job 13 Architectural Drawing - Hip Roof
Job 14 Architectural Drawing - Cornice Details
RSA 10 Architectural Drawing - Stair Details
Job 15 Architectural Drawing - Stair Section
Job 16 Architectural Drawing - Plan View of Stairs

Unit XVI Plumbing and Piping Drawings
RSA 1 Plumbing and Piping Drawings - Drainage and Waste Systems and Pipe Symbols
Job 1 Plumbing and Piping Drawings - Use Piping Symbols
RSA 2 Plumbing and Piping Drawings - Preparing the Drawings
Job 2 Plumbing and Piping Drawings - Construct an Isometric Piping Diagram

Unit XVII Heating, Ventilating and Air Conditioning
RSA 1 Heating, Ventilating and Air Conditioning - Heating Systems

## Unit XVII Heating, Ventilating and Air Conditioning (Continued)

| | | |
|---|---|---|
| Job | 1 | Heating, Ventilating and Air Conditioning - Prepare a Ductwork Layout |
| RSA | 2 | Heating, Ventilating and Air Conditioning - Ventilating and Air Conditioning Systems |
| Job | 2 | Heating, Ventilating and Air Conditioning |

## Unit XVIII Topographical Drawing

| | | |
|---|---|---|
| RSA | 1 | Topographical Drawing - Maps |
| RSA | 2 | Topographical Drawing - Surveying |
| Job | 1 | Topographical Drawing |
| RSA | 3 | Topographical Drawing - Use and Interpretation of Title Certificates |
| Job | 2 | Topographical Drawing - Plotting from Title Certificate |
| RSA | 4 | Topographical Drawing - Interpretation of Field Notes |
| Job | 3-8 | Topographical Drawing - Plotting from Field Notes |
| RSA | 5 | Topographical Drawing - Profiles and Cross Sections |
| Job | 9 | Topographical Drawing - Plotting a Profile from Field Notes |
| RSA | 6 | Topographical Drawing - Contour Lines |
| Math | 1 | Using Decimal Equivalents of One Foot |
| Job | 10 | Topographical Drawing - Prepare a Contour Map from Field Notes |
| RSA | 7 | Topographical Drawing - Interpretation of Aerial Photographs |
| RSA | 8 | Topographical Drawing - Property Plats, Coordinates and Acreage Calculations |
| RSA | 9 | Topographical Drawing - Permit Drawings |
| Math | 2A | Trigonometry - Right-Angled Triangles |
| Math | 2B | Trigonometry |
| Math | 2C | Trigonometry |
| Math | 2D | Trigonometry |
| Math | 2E | Trigonometry |
| Math | 2F | Trigonometry - Oblique Triangles |
| Math | 2G | Trigonometry - Oblique Triangles |
| Math | 2H | Trigonometry - Oblique Triangles |
| Math | 2I | Trigonometry - Oblique Triangles |
| Math | 2J | Trigonometry - Oblique Triangles |
| RSA | 10 | Topographical Drawing - Land Survey Drawings |

## Unit XIX Structural Steel (Tentative)

| | | |
|---|---|---|
| RSA | 1 | The Structural Steel Frame - Present and illustrate the steel framing system, structural steel shapes, and the relationship between design drawings and shop fabrication details |
| Math | 1 | Calculate weights of steel shapes given |

Unit XIX Structural Steel (Tentative)
(Continued)

| | | |
|---|---|---|
| Job | 1 | Indicate all dimensions of sectional structural steel shapes presented; given - pictorial sections with size and detailed dimensions in table form |
| RSA | 2 | Erection and Shipping Marks - Present and illustrate |
| Math | 2 | Calculate weights of steel shapes given |
| Job | 2 | Provide shipping and erection marks for the steel members shown; given - plan and elevation of design and drawings for a multi-story building |
| RSA | 3 | Dimensioning Structural Steel Details - Present and illustrate how these dimensions vary from architectural practice |
| Math | 3 | Practice common scales used; calculate dimensions; calculate total tonnage |
| Job | 3 | Provide the missing dimensions on the shop details provided; given - shop details; structural steel tables |
| RSA | 4 | Beam Connections - Present and illustrate the types of connections and the standardization into six series |
| Math | 4 | Prepare an itemized bill of material for Job 3 this unit |
| Job | 4 | Detail 18 beams for the second floor; given - set of design drawings; structural steel tables |
| RSA | 5 | Column Detailing - Present and illustrate the components necessary for complete column detailing |
| Math | 5 | Calculate the individual weights of the beams detailed in Job 5 |
| Job | 5 | Detail 36 columns for two tiers given - set of design drawings used for previous jobs; structural steel tables |
| RSA | 6 | Detailing Members of the Bracing Unit - Present and illustrate |
| Math | 6 | Calculate angles and legs of triangles; review of basic trigonometry; use of tables; calculate weights of columns in Job 5 |
| Job | 6 | Detail all bracing; given - set of design drawings used in previous jobs; structural steel tables |
| RSA | 7 | Detailing Trusses - Present and illustrate the various types of trusses and relationship between design and shop details |
| Math | 7 | Calculate weights of the structural steel used in Job 6; review trigonometry |
| Job | 7 | Detail all trusses; given - set of design drawings used in previous jobs; structural steel tables |
| RSA | 8 | Miscellaneous Iron Details - Present and illustrate the difference between structural steel frames and miscellaneous iron |

Unit XIX Structural Steel (Tentative)
(Continued)

| | | |
|---|---|---|
| Math | 8 | Calculate weights of trusses in Job 7 |
| Job | 8 | Detail all miscellaneous iron indicated given - design drawings used in previous jobs; structural steel tables; architectural details required |

Unit XX Intersections and Developments

| | | |
|---|---|---|
| RSA | 1 | Intersections and Developments - Truncated Prisms |
| Job | 1 | Intersections and Developments - Develop a Truncated Prism |
| RSA | 2 | Intersections and Developments - Right Cylinders |
| Job | 2 | Intersections and Developments - Develop a Right Cylinder |
| RSA | 3 | Intersections and Developments - Right Pyramids |
| Job | 3 | Intersections and Developments - Develop a Right Pyramid |
| RSA | 4 | Intersections and Developments - True-Length Diagrams |
| Job | 4 | Intersections and Developments - Develop an Oblique Cone |
| RSA | 5 | Intersections and Developments - Truncated Cones |
| Job | 5 | Intersections and Developments - Truncated Cone |
| RSA | 6 | Intersections and Developments - Transition Pieces |
| Job | 6 | Intersections and Developments - Develop a Transition Piece |
| RSA | 7 | Intersections and Developments - Surfaces of Spheres |
| Job | 7 | Intersections and Developments - Develop the Surface of a Sphere |
| RSA | 8 | Intersections and Developments - Elbow on Development |
| Job | 8 | Intersections and Development - Develop a Three-Piece Elbow |
| RSA | 9 | Intersections and Developments - Intersection of Prisms |
| Job | 9 | Intersections and Developments - Develop Intersecting Prisms |
| RSA | 10 | Intersections and Developments - Cylindrical Intersection |
| Job | 10 | Intersections and Developments - Develop Intersecting Cylinders |
| RSA | 11 | Intersections and Developments |
| Job | 11 | Intersections and Developments - Develop an Intersecting Prism and Cylinder |
| RSA | 12 | Intersections and Developments - Intersection of a Cylinder and a Cone |

Unit XX Structural Steel (Tentative)
(Continued)

| | | |
|---|---|---|
| Job | 12 | Intersections and Developments - Develop an Intersecting Cylinder and Cone |

Unit XXI Engineering Charts and Graphs

| | | |
|---|---|---|
| RSA | 1 | Engineering Charts and Graphs - Rectangular Grid Systems |
| Job | 1 | Engineering Charts and Graphs |
| Job | 2 | Engineering Charts and Graphs - Construct a Profile Graph |
| Job | 3 | Engineering Charts and Graphs - Construct a Multiple-Curve Graph |
| RSA | 2 | Engineering Charts and Graphs - Rectilinear and Logarithmic Charts |
| Job | 4 | Engineering Charts and Graphs - Construct a Rectilinear Chart - Time Series |
| RSA | 3 | Engineering Charts and Graphs - Display Charts - Bar Charts |
| Job | 5 | Engineering Charts and Graphs - Construct a Bar Chart |
| Job | 6 | Engineering Charts and Graphs - Construct a Bar Chart |
| Job | 7 | Engineering Charts and Graphs - Construct a Bar Chart |
| RSA | 4 | Engineering Charts and Graphs - Circle Graphs |
| Job | 8 | Engineering Charts and Graphs - Construct a Pie Chart |
| Job | 9 | Engineering Charts and Graphs - Construct a Pie Chart |
| RSA | 5 | Engineering Charts and Graphs - Pictorial Charts |
| Job | 10 | Engineering Charts and Graphs - Construct a Pictorial Chart |
| RSA | 6 | Engineering Charts and Graphs - Organization and Flow Charts |
| Job | 11 | Engineering Charts and Graphs - Construct an Organization Chart |
| Job | 12 | Engineering Charts and Graphs - Construct a Flow Chart |
| RSA | 7 | Engineering Charts and Graphs |
| Job | 13 | Engineering Charts and Graphs - Use a Graph to Change Feet Per Second To Miles Per Hour |
| Job | 14 | Engineering Charts and Graphs - Use Graphs to Determine Horsepower |
| Job | 15 | Engineering Charts and Graphs - Use Graphs to Determine Time Elements and Contour Lines |

Unit XXII Reproduction Processes

| | | |
|---|---|---|
| RSA | 1 | Reproduction Processes |

The Watchmaking Technology Course was published in 1964-65 and is available in book form for the instructors and in loose form for students. It is composed of thirty-three units.

The references for the Watchmaking Technology Course are listed below.

| Title | Source |
|---|---|
| Fried, Henry B.<br>THE WATCH REPAIRER'S MANUAL<br>2nd Edition | D. Van Nostrand Co., Inc.<br>120 Alexander Street<br>Princeton, New Jersey |
| ABC'S OF HAND TOOLS | General Motors Corporation<br>Detroit, Michigan |
| BULOVA WATCH REPAIR MANUAL<br>3rd Edition | Bulova School of Watchmaking<br>Bulova Park<br>Flushing 70, New York |
| Olivo, Thomas C. and Payne, Albert V.<br>BASIC BLUEPRINT AND SKETCHING | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Hood, Grant<br>MODERN METHODS IN HOROLOGY | Bradley Polytechnic Institute<br>Peoria, Illinois |
| DeCarle, Donald<br>WITH THE WATCHMAKER AT THE BENCH | Sir Isaac Pitman & Sons, Ltd.<br>London |
| Goodrich, Ward<br>THE WATCHMAKER'S LATHE | North American Watch Tool and Supply Co.<br>Chicago, Illinois |
| Levin, Louis, and Levin, Samuel<br>PRACTICAL BENCHWORK FOR HOROLOGISTS<br>6th Edition | Louis Levin & Son<br>Los Angeles, California |
| Milham, Willis<br>TIME AND TIMEKEEPERS | The Macmillan Company<br>Sixty Fifth Avenue<br>New York 44, New York |

A detailed outline of the Watchmaking Technology Course follows.

Unit I Rules and Regulations (Tentative)

Course Outline (Continued)

Unit II Prepare Hand Tools
RSA 1
Job 1 Make a Regular 3/16 Graver
Job 2 Make a Lorenge 3/16 Graver
Job 3 Make a Regular 1/8 Graver
Job 4 Make a Lorenze 1/8 Graver
Job 5 Make a Round-End Graver (Small rounding)
Job 6 Make a Squaring Graver
Job 7 Make a Parting Tool
Job 8 Make a Round-End Graver (Large rounding)
Job 9 Make a Pivot Burnisher
Job 10 Make a General Purpose Burnisher

Unit III Heat Treatment of Steel (Hardening and Tempering)
RSA 1
Job 1 Harden Six Pieces of Steel Rod, Different Sizes
Job 2 Harden Gravers
Job 3 Harden Burnishers
RSA 2
Job 4 Temper the Six Pieces of Drill Rod, Hardened in Job 1
Job 5 Temper Gravers

Unit IV Finish Hand Tools
RSA 1
Job 1 Make Handles for Tools Made in Unit II
Job 2 Sharpen and Polish Hand Tools Made in Unit II

Unit V Sawing and Filing
RSA 1
Job 1 File a Tapered Pin
Job 2 Make a Spatula
Job 3 Make a Pallet Warmer
Job 4 Make Two Beat Tools
Job 5 Make Two Beat Tools
Job 6 Make a Polishing Shovel

Unit VI Lathe Turning
RSA 1
Job 1 Disassemble, Clean, and Reassemble Lathe
Job 2 Make a Stepped Section
Job 3 Make Two Single Tapers
Job 4 Make Connecting Tapers
Job 5 Make Divided Sections
Job 6 Make Three Connected Balls

Unit VII Lathe Turning and Drilling
RSA 1
Job 1 Make a Flat-Nose Punch

Unit VII Lathe Turning and Drilling (Continued)
Job 2 Make a Round-Nosed Punch
Job 3 Make a Centering Punch
Job 4 Make a Center Punch
Job 5 Make a Screw Extracting Punch
Job 6 Make a Taper Mouth Punch
Job 7 Cut Eight Perfect Centers
Job 8 Make Two Double-End Jewel Pushers
Job 9 Make a Conical Pivot
Job 10 Make a Large Balance Staff (Brass)
Job 11 Make a Large Balance Staff (Steel)
Job 12 Make a Large Stem
Job 13 Make a Small Stem
Job 14 Make a Bushing
Job 15 Make a Case Screw
Job 16 Make a Balance-Cock Screw
Job 17 Make a Small Plate Screw
Job 18 Make a 16 Size Balance Staff
Job 19 Make a 12 Size Balance Staff
Job 20 Make a Screw Plate
Job 21 Make Four Screws for the Screw Plate
Job 22 Make a Balance Tack

Unit VIII Drills and Taps
RSA 1
Job 1 Make a Flat Drill 1.80mm
Job 1 Make a Flat Drill 1.60mm
Job 3 Make a Flat Drill 1.50mm
Job 4 Make a Flat Drill 1.30mm
Job 5 Make a Flat Drill 1.10mm
Job 6 Make a Flat Drill 1.00mm
RSA 2
Job 7 Make a Tap 3.00mm
Job 8 Make a Tap 1.60mm
Job 9 Make a Tap 2.30mm
Job 10 Make a Tap 2.00mm
Job 11 Make a Tap 1.70mm

Unit IX Alarm Clocks (Tentative)
RSA 1
Job 1 Remove Clock Movements From Cases
Job 2 Remove and Replace Clock Hands
Job 3 Remove and Replace Balance Assembly
Job 4 Center and Level Hairspring
Job 5 Adjust Alarm Mechanism
Job 6 Remove and Replace Main Spring
Job 7 Disassemble and Reassemble Clock
Job 8 Clean a Clock
Job 9 Polish Clock Pivots
Job 10 Make and Replace Balance Bushing

Unit IX Alarm Clocks (Tentative)
(Continued)

Job 11 Make and Replace Balance Staff
Job 12 Close Pivot Holes
Job 13 Rebush Pivot Holes
Job 14 Replace Pallet Pins
Job 15 Replace Cannon Pinion
Job 16 Check Depthing of Wheels
Job 17 Straighten and Level Bent Wheels
Job 18 Adjust and Rate Three Clocks

Unit X Pendulum Clocks
RSA 1
Job 1 Adjust Striking Mechanism
Job 2 Replace Pendulum Spring
Job 3 Adjust Lock and Slide
Job 4 Disassemble and Assemble Pendulum Clock
Job 5 Replace Mainspring
Job 6 Adjust and Rate a Pendulum Clock

Unit XI Preparation for Pivoting
RSA 1
Job 1 Make Ten Pivot Drills
Job 2 Harden and Temper Pivot Drills
Job 3 Sharpen Pivot Drills

Unit XII Pivoting
RSA 1
Job 1 Make a Square-Shouldered Pivot
Job 2 Pivot Steel Stock
Job 3 Repivot Two Clock Wheels
Job 4 Repivot 16 Size Center Wheel
Job 5 Repivot 16 Size Third Wheel
Job 6 Repivot 16 Size Fourth Wheel

Unit XIII Hairsprings
RSA 1
Job 1 Pin Ten Hairsprings into Studs
Job 2 Pin Ten Hairsprings into Collets
Job 3 True Hairsprings in Round
Job 4 True Hairsprings in Flat
Job 5 Vibrate Hairspring to Wheel

Unit XIV Jeweling Tools and Jewel Setting
RSA 1
Job 1 Make a Jewel Graver
Job 2 Make a Jewel Burnisher
Job 3 Make a Jewel Stripper
Job 4 Set Five Burnished in Cap Jewels
Job 5 Set Five Burnished in Balance Hole Jewels
Job 6 Set Six Burnished in Jewels into Brass Plate

### Unit XIV Jeweling Tools and Jewel Setting (Continued)

Job 7 Set Three Friction Cap Jewels into Bushings
Job 8 Set Three Friction Balance Hole Jewels into Bushings
Job 9 Set Six Friction Jewels into Brass Plate
Job 10 Remove and Replace Jewels in Watch Plates

### Unit XV Staffing

RSA 1
Job 1 Staff Six Balance Wheels, With Rivet Type Staff
Job 2 Staff Two Balance Wheels, Friction Type Staff
Job 3 Remove Two Standard Riveted Staffs From Wheels
Job 4 Remove Friction Staffs From Wheels
Job 5 Remove Side and Top Groove Staffs

### Unit XVI Truing and Poising

RSA 1
Job 1 True Six Balance Wheels
Job 2 Poise Six Balance Wheels
Job 3 Make a Staff for 16 Size Balance Wheel, True and Poise

### Unit XVII Pocket Watches

RSA 1
Job 1 Remove and Replace Hands
Job 2 Remove and Replace Dial
Job 3 Remove and Replace Elgin Balance Assembly
Job 4 Remove and Replace Hamilton Balance Assembly
Job 5 Remove and Replace Waltham Balance Assembly
Job 6 Disassemble and Reassemble 16 Size Watch Movements
Job 7 Make a Hairspring-Collet Removing Tool
Job 8 Remove and Replace Hamilton, Elgin, and Waltham Hairsprings.
Job 9 Remove and Replace all Types of Roller Tables
Job 10 Replace Roller Jewels
RSA 2
Job 11 Replace Balance Cock Jewels
Job 12 Measuring, Selecting, and Fitting Balance Staff
Job 13 Restaff Hamilton Balance Wheel
Job 14 Restaff Elgin Balance Wheel
Job 15 Restaff Waltham Balance Wheel
Job 16 Replace Elgin Mainspring
Job 17 Replace Hamilton Mainspring
Job 18 Replace Waltham Mainspring
Job 19 Check and Adjust End and Side Shake in Time Train
Job 20 Straighten bent Wheels
Job 21 Install Two Jewels on Escape Wheel

Unit XVII Pocket Watches
(Continued)

Job 22 Replace Center Hole Jewel
Job 23 Check Depthing
Job 24 Close Holes on Time Train
Job 25 Replace Minute Wheel Post
Job 26 Tighten Elgin Cannon Pinion
Job 27 True Bent Center Posts
Job 28 Replace Wheel in Hamilton Dial Train
Job 29 Alter Screws from an Assortment, to Fit into Watch
Job 30 Make and Replace Three Click Springs
Job 31 Make and Replace Winding Arbor (using sample)
Job 32 Make and Replace Winding Arbor (without sample)
Job 33 Replace Broken Regulator Pins
Job 34 Remove Rusty Screws
Job 35 Remove Broken Screws
Job 36 Straighten Bent Pivots
Job 37 Make and Replace Broken Detent Screw
Job 38 Make Hamilton Pallet Arbor
Job 39 Replace Broken Pallet Arbors
Job 40 Fit New Pair or Hands to Watch
Job 41 Convert Seven Jewel Watch to Fifteen Jewel Watch
Job 42 Disassemble, Clean, Oil and Reassemble Pocket Watch
Job 43 Repair Test Watch and Enter into Log
Job 44 Estimate Work on Test Watches

Unit XVIII Escapement
RSA 1
Job 1 Manipulate Model Escapement
Job 2 Remove and Replace Pallet Stones
Job 3 Make Escapement Checks on 16 Size Hamilton
Job 4 Match Escapement on 16 Size Hamilton
Job 5 Match Escapement on 16 Size Elgin

Unit XIX Electric Clocks
RSA 1
Job 1 Adjust Alarm Mechanism
Job 2 Disassemble and Reassemble Clock
Job 3 Replace Motor
Job 4 Check and Replace Coil
Job 5 Clean and Oil Electric Clock

Unit XX Crystal Fitting
RSA 1
Job 1 Fit Crystal to 16 Size Watch
Job 2 Fit Crystal to 12 Size Watch
Job 3 Fit Crystal to 6/0 Size Watch

Unit XX Crystal Fitting
(Continued)

Job 4 Fit Crystal to 10/0 Size Watch
Job 5 Fit Crystal to 10 1/2 Ligne Watch
Job 6 Fit Fancy Crystal to 10 1/2 Ligne Watch
Job 7 Fit Fancy Crystal to 8 3/4 Ligne Watch
Job 8 Fit Fancy Crystal to 6 3/4 Ligne Watch
Job 9 Fit Fancy Crystal to 5 Ligne Watch
Job 10 Replace Round, Waterproof Crystals, With Crystal Inserter
Job 11 Replace Crystals in Elgin, Wyler, Gruin With the Use of the Number System
Job 12 Grind "Near Fit" Crystals to Fit Bezels

Unit XXI Shaping Overcoils
RSA 1
Job 1 Form Four Overcoils, Using Gradual Bend Method
Job 2 Form Four Overcoils, Using Knee Bend Method
Job 3 Vibrate Hairspring and Form Overcoils for Two Pocket Watches

Unit XXII Polishing Machine
RSA 1
Job 1 Polish 16 Size Silver Case
Job 2 Polish 16 Size White Gold Case
Job 3 Polish 16 Size Yellow Gold Case
Job 4 Polish 16 Size Yellow Gold Filled Case
Job 5 Polish 10 Ligne Stainless Steel Case
Job 6 Polish 6 3/4 Ligne Gold Filled Case
Job 7 Polish Plastic Watch Crystals
Job 8 Polish Pocket Watch Chain

Unit XXIII Chronometer Watches and Marine Chronometers
RSA 1
Job 1 Disassemble, Clean, Oil, and Reassemble 22 Size Hamilton Chronometer Watch
Job 2 Disassemble, Clean, Oil and Reassemble 36 Size Waltham Chronometer Watch
Job 3 Disassemble, Clean, Oil, and Reassemble 18 Size Elgin Chronometer Watch
Job 4 Adjust and Rate Elgin, Hamilton, and Waltham Chronometer Watches
RSA 2
Job 5 Disassemble, Clean, Oil, and Reassemble a Marine Chronometer
Job 6 Adjust and Rate a Marine Chronometer

Unit XXIV Material Cabinets and Systems
RSA 1
Job 1 Fingerprint a Swiss Watch
Job 2 Identify and Obtain Replacement Parts for Practice Movements

Unit XXV Wrist Watches
Job 1 Disassemble, Clean, Oil and Reassemble 10 1/2 Ligne Wrist Watch
Job 2 Replace Mainspring in Wrist Watch
Job 3 Tighten Cannon Pinion
Job 4 Replace Stem
Job 5 Make and Install Click and Clutch Spring
Job 6 Replace Balance Hole Jewels
Job 7 Replace Pallet Bridge Jewel
Job 8 Make and Install Pallet Arbor
Job 9 Replace Six Pallet Arbors in Swiss and American Watch Movements
Job 10 Replace Pallet Stones and Adjust Lock
Job 11 Install Four Roller Jewels
Job 12 Staff 10 1/2 Ligne Watch
Job 13 Staff 8 3/4 Ligne Watch
Job 14 Staff 6 3/4 Ligne Watch
Job 15 Staff 5 Ligne Watch
Job 16 Make a Stem to Fit a 10 1/2 Ligne Watch Without the Use of a Sample
Job 17 Replace Banking Pins
Job 18 Overhaul Rusty Movement
Job 19 Polish Pivots in 6 3/4 Ligne Watch
Job 20 Replace Regulator Pins and Boots
Job 21 Replace Broken Guard Finger
Job 22 Repair Test Watch and Enter into Log Book

Unit XXVI Self-Winding Watches
RSA 1
Job 1 Dismantle and Reassemble a Self-Winding Watch
Job 2 Replace Broken Oscillating Weight Axle
Job 3 Replace Driving Gear Arbor
Job 4 Replace Oscillating Weight Bushings and Jewels
Job 5 Make and Replace Stop Click Spring
Job 6 Replace Broken Mainspring
Job 7 Replace Broken Slip Spring
Job 8 Adjust Side Shake in Oscillating Weight Bushing
Job 9 Clean, Oil, and Adjust Four Self-Winding Watches

Unit XXVII Complicated Watches
RSA 1
Job 1 Disassemble and Reassemble Two Calendar Watches
Job 2 Disassemble, Clean, Oil, and Adjust Calendar Wrist Watch
RSA 2
Job 3 Disassemble and Reassemble a Wrist Alarm Watch
Job 4 Disassemble, Clean, Oil, and Adjust Wrist Alarm
RSA 3
Job 5 Disassemble and Reassemble, in Stages, a Chronograph Wrist Watch
Job 6 Adjust Meshing of Gears for the Sweep Second Hand

Unit XXVII Complicated Watches
(Continued)

- Job 7 Adjust Minute Counter
- Job 8 Adjust Rate With Timer Mechanism Engaged and Timer Mechanism Disengaged
- Job 9 Adjust Fly-Back Mechanism

Unit XXVIII Waterproofing Watches

- RSA 1
- Job 1 Test Four Watches Using Air Pressure Principle
- Job 2 Replace Leaky Crystal and Secure it Airtight
- Job 3 Replace Four Case Pipes and Test for Waterproofness
- Job 4 Replace Leaky Crowns on Practice Watches
- Job 5 Replace Case Back, Gaskets and Test
- Job 6 Waterproof Watch With One Piece Case

Unit XXIX Adjusting to Positions

- RSA 1
- Job 1 Adjust 16 Size Elgin to 3 Positions
- Job 2 Adjust 16 Size Hamilton to 3 Positions
- Job 3 Adjust American Wrist Watch to 3 Positions
- Job 4 Adjust Swiss Wrist Watch to 3 Positions
- Job 5 Adjust 16 Size Elgin (R.R.) to 5 Positions
- Job 6 Adjust 16 Size Hamilton R.R.) to 5 Positions

Unit XXX Electric Wrist Watches

- RSA 1
- Job 1 Disassemble and Reassemble Electric Watches (three)
- Job 2 Clean 3 Electric Watches
- Job 3 Replace Energy Cells in Electric Watches
- Job 4 Check the Coil in a Electric Watch
- Job 5 Adjust Contact Points
- Job 6 Adjust Trip Spring
- Job 7 Adjust and Rate Three Electric Watches
- Job 8 Adjust Shake in Electric Watches

Unit XXXII. Electronic Wrist Watches

Unit XXXIII. General Watch Repair

FINAL TEST

- Written Test (Theory)
- Practical Test (Bench Work)

The Welding Jobs, Instructor's Guides and Tests were published in 1958 and revised in 1963. Each Job contains Related Study Assignments and when necessary, math and technical information. The Welding Course Mathematics was published in 1952. The Welding Course is available in the following forms:

Jobs and Tests are available in loose form for the students. Job and Test Books are available for the instructors.

Book I - Units I and II
Book II - Units III and IV
Mathematics (Welding Course Math)
Blueprint Reading and Sketching (From Oklahoma A and M College reprinted by the Lab.)

Test Book I - Units I, II, III and IV
Answer Book - Units I, II, III and IV

The following instructor's aids are available:
Permanent Record Folder
Wall Progress Chart

The References for the Welding Course are the following:

| Title | Source |
|---|---|
| Potter<br>OXYACETYLENE WELDING | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| Bennett and Siy<br>BLUEPRINT READING FOR WELDERS | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| WELDING COURSE MATHEMATICS | Louisiana State Voc.-Tech.<br>Curriculum Laboratory<br>P. O. Box 657<br>Natchitoches, Louisiana |
| Althouse-Turnquist<br>MODERN WELDING PRACTICE | The Goodheart-Willcox Co., Inc.<br>1322 South Wabash Avenue<br>Chicago 5, Illinois |
| THE OXYACETYLENE HANDBOOK | The Linde Company<br>270 Park Avenue<br>New York 17, New York |

References (Continued)

| Title | Source |
|---|---|
| OXYACETYLENE WELDING AND CUTTING | Air Reduction Sales Co., Inc.<br>Div. of Air Reduction Co., Inc.<br>2507 Larkspur Street<br>Baton Rouge, Louisiana |
| | Air Reduction Sales Co., Inc.<br>Div. of Air Reduction Co., Inc.<br>6031 St. Vincent Avenue<br>Shreveport, Louisiana |
| | Air Reduction Salse Co., Inc.<br>Div. of Air Reduction Co., Inc.<br>1406 S. Rendon<br>New Orleans 75, Louisiana |
| Sacks<br>THEORY AND PRACTICE OF ARC WELDING | D. Van Nostrand Co., Inc.<br>120 Alexander Street<br>Princeton, New Jersey |
| NEW LESSONS IN ARC WELDING | Lincoln Electric Co.<br>22801 St. Clair Avenue<br>Cleveland 17, Ohio |
| Roden and Griffin<br>BASIC ARC WELDING | Delmar Publishers Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Blodgett-Scalzi<br>DESIGN OF WELDED STRUCTURAL CONNECTIONS | Lincoln Electric Co.<br>22801 St. Clair Avenue<br>Cleveland 17, Ohio |
| Frankland,<br>PIPE FITTER'S AND PIPE WELDER'S HANDBOOK | The Bruce Publishing Co.<br>400 North Broadway<br>Milwaukee 1, Wisconsin |
| FABRICATION OF OXY-ACETYLENE WELDED STEEL AND WROUGHT IRON PIPING | The Linde Company<br>270 Park Avenue<br>New York 17, New York |

A detailed outline of the Welding Course follows:

UNIT I - WELDING - OXYACETYLENE CUTTING

Job 1 Set Up Oxyacetylene Equipment (Flat)
Job 2 To Cut Steel Plate (Flat)
Job 3 Cutting Odd Shapes (Flat)
Job 4 To Pierce Steel Plate (Flat)
Job 5 Manipulative Test (Flat)

Course Outline (Continued)

## UNIT II - WELDING - OXYACETYLENE WELDING

Job 1 Deposit Beads
Job 2 Welding with Filler Rod
Job 3 Corner Joint
Job 4 Butt Weld Mild Steel
Job 5 Lap Weld Mild Steel
Job 6 Manipulative Test
Job 7 Butt Weld
Job 8 Lap Joint
Job 9 Vee-Butt Joint
Job 10 Butt Joint
Job 11 Lap Joint
Job 12 Manipulative Test
Job 13 Bronze Weld Mild Steel
Job 14 Braze-Weld Cast Iron
Job 15 Silver Solder a Lap Joint of Copper
Job 16 Manipulative Test
Job 17 Butt Weld Pipe (Roll)
Job 18 Butt Weld Pipe (Bell Hold)
Job 19 Butt Weld Pipe
Job 20 Manipulative Test

## UNIT III - WELDING - ARC WELDING

Job 1 Stringer Beads (Flat)
Job 2 Weave Beads (Flat)
Job 3 Edge Joint (Flat)
Job 4 Tee Joint (Flat)
Job 5 Outside Corner Joint (Flat)
Job 6 V-Butt Joint - Back up Strip (Flat)
Job 7 V-Butt Joint - Open (Flat)
Job 8 Manipulative Test
Job 9 Stringer Beads (Horizontal)
Job 10 Lap Joint (Horizontal)
Job 11 Tee Joint - Stringer Beads (Horizontal
Job 12 Tee Joint - Weave Beads (Horizontal)
Job 13 V-Butt Joint - Back up Strip (Horizontal)
Job 14 V-Butt (Open) (Horizontal)
Job 15 Manipulative Test
Job 16 Stringer Beads (Travel down) (Vertical)
Job 17 Lap Joint (Travel down) (Vertical)
Job 18 Stringer Beads (Travel up) (Vertical)
Job 19 Weave Beads (Travel up) (Vertical)
Job 20 Lap Joint (Travel up) (Vertical)
Job 21 Tee Joint (Travel up) (Vertical)
Job 22 Corner Joint (Travel up) (Vertical)

## UNIT III - WELDING - ARC WELDING

| | | |
|---|---|---|
| Job | 23 | V-Butt Joint (Back up strip, travel up) (Vertical) |
| Job | 24 | V-Butt Joint (Open) (Vertical) |
| Job | 25 | Manipulative Test |
| Job | 26 | Stringer Bead (Overhead) |
| Job | 27 | Weave Beads (Overhead) |
| Job | 28 | Lap Joint (Overhead) |
| Job | 29 | Tee Joint (Overhead) |
| Job | 30 | V-Butt Joint (Back up strip) (Overhead) |
| Job | 31 | V-Butt Joint (Open) (Overhead) |
| Job | 32 | Manipulative Test |
| Job | 33 | Roll Weld Pipe |
| Job | 34 | Butt Weld Pipe |
| Job | 35 | Butt Weld Pipe |
| Job | 36 | Orange Peel |
| Job | 37 | Lay Out 6" Branch for 6" Header |
| Job | 38 | Reducing Lateral |
| Job | 39 | Concentric Reducer |
| Job | 40 | Fabricate Piping Offset |
| Job | 41 | Weld Flange on Pipe |

## UNIT IV - INERT GAS WELDING

| | | |
|---|---|---|
| Job | 1 | Stringer Beads without Filler Rod |
| Job | 2 | Stringer Beads Using Filler Rod |
| Job | 3 | Tee Joint on Aluminum |
| Job | 4 | Butt Joint on Aluminum Plate |
| Job | 5 | Butt Weld Pipe (Roll Weld) |

This course was written in 1950 and revised in 1960. There are X units available in the following book form.

Book I - Unit I Related Study Assignments
Book II - Unit II Related Study Assignments
Book III - Unit III Related Study Assignments
Book IV - Unit IV Related Study Assignments
Book V - Units V & VI Related Study Assignments
Book VI - Units VII & VIII Related Study Assignments
Book VII - Units IX & X Related Study Assignments

Test Book I - Unit I
Test Book II - Unit II
Test Book III - Unit III
Test Book IV - Unit IV
Test Book V - Units V & VI
Test Book VI - Units VII & VIII
Test Book VII - Units IX & X
Answer Book - Units I-X

References for the Carpentry Apprentice Course are listed below.

| Title | Source |
|---|---|
| Dalzell, Ralph J.,<br>BUILDING TRADE BLUEPRINT READING, 3rd Ed. | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| CONCRETE FORM CONSTRUCTION | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Wilson, J. Douglas and Rogers, Clell M.,<br>CARPENTRY MATHEMATICS, 2nd Ed. | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| FRAMING, SHEATHING AND INSULATION | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| CARPENTRY APPRENTICE TRAINING COURSE | United Brotherhood of Carpenters and Joiners of America<br>222 E. Michigan St.<br>Indianapolis 4, Indiana |
| Wilson, J. Douglas and Werner, S. O.<br>SIMPLIFIED ROOF FRAMING | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| INTERIOR AND EXTERIOR TRIM | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| THE USE OF HAND TOOLS AND PORTABLE MACHINERY | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |

References (Continued)

| Title | Source |
|---|---|
| Wilson, J. Douglas and Roger, Clell M., SIMPLIFIED CARPENTRY ESTIMATING | Simmons-Broadman Publishing Corp.<br>30 Church Street<br>New York 7, New York |

A detailed course outline is given below.

Unit I - Foundations
- R.S.A. A - Orientation for Carpentry Apprentice (Information Sheet)
- R.S.A. B - How to Use This Course in Related Information for Carpentry Apprentices (Information Sheet)
- R.S.A. 1 - Whole Numbers
- R.S.A. 2 - Fractions
- R.S.A. 3 - Measuring Tools and Their Uses
- R.S.A. 4 - Plumbing and Leveling Tools
- R.S.A. 5 - Cutting and Striking Tools
- R.S.A. 6 - Use and Care of the Hand Saw
- R.S.A. 7 Form Lumber
- R.S.A. 8 - Form Ties
- R.S.A. 9 - Batter Boards (Information Sheet)
- R.S.A. 10 - Property Lines, Building Location, Excavation Lines, Diagonals (Information Sheet)
- R.S.A. 11 - How to Lay Out Building Lines
- R.S.A. 12 - How to Use Materials in Form Construction
- R.S.A. 13 - Anchor Bolts
- R.S.A. 14 - Concrete Footings and Piers
- R.S.A. 15 - Pier and Footing Form Construction
- R.S.A. 16 - Foundation Wall Forms
- R.S.A. 17 - Foundation Wall Forms (Continued) (Information Sheet)
- R.S.A. 18 - Openings in Concrete Walls

Unit II - Frame Construction
- R.S.A. A - Orientation for Carpenter Apprentice (Information Sheet)
- R.S.A. B - How To Use This Course in Related Information for Carpentry Apprentices (Information Sheet)
- R.S.A. 1 - The Present-Day Home and its Predecessor (Information Sheet)
- R.S.A. 2 - Metal Fastenings
- R.S.A. 3 - Carpentry Tools of Wood (Information Sheet)
- R.S.A. 4 - Termites and Decay (Information Sheet)
- R.S.A. 5 - Types of Frame Construction
- R.S.A. 6 - Sills
- R.S.A. 7 - Girders
- R.S.A. 8 - The Lower Frame in Louisiana (Information Sheet)
- R.S.A. 9 - Floor Joists, Herringbone Bridging

Course Outline (Continued)

R.S.A. 10 - Subflooring
R.S.A. 11 - Horizontal Frame Layout (Information Sheet)
R.S.A. 12 - Vertical Frame Layout, The "Story Pole" (Information Sheet)
R.S.A. 13 - Balloon Frame Layout, Corner Post, Walls, and Second-floor Joists (Information Sheet)

Unit III - Roof Framing
R.S.A. A - Orientation for Carpentry Apprentice (Information Sheet)
R.S.A. B - How to Use This Course in Related Information for Carpentry Apprentices (Information Sheet)
R.S.A. 1 - Roofs, Past and Present (Information Sheet)
R.S.A. 2 - Roof Types and Terms
R.S.A. 3 - Principles of Roof Framing
R.S.A. 4 - The Common Rafter (Information Sheet)
R.S.A. 5 - The Hip Rafter "Length"
R.S.A. 6 - The Hip Rafter "Cuts"
R.S.A. 7 - The Hip Jack Rafter
R.S.A. 8 - The Hip Jack Rafter (Continued) (Information Sheet)
R.S.A. 9 - The Valley Rafter
R.S.A. 10 - The Valley and Cripple Jacks
R.S.A. 11 - Special Roof Framing Problems
R.S.A. 12 - The Steel Square and Its Use
R.S.A. 13 - Using the Tables on the Steel Square

Unit IV - Exterior Trim
R.S.A. A - Orientation for Carpentry Apprentice (Information Sheet)
R.S.A. B - How to Use This Course (Information Sheet)
R.S.A. 1 - Description of Common Types of Cornices
R.S.A. 2 - Mouldings (Information Sheet)
R.S.A. 3 - How to Build Common Cornices
R.S.A. 4 - Wood Shingles
R.S.A. 5 - How to Lay Wood Shingles
R.S.A. 6 - Overroofing with Shingles (Information Sheet)
R.S.A. 7 - Composition Roof Covering
R.S.A. 8 - Composition, Iron and Aluminum Roof Covering (Information Sheet)
R.S.A. 9 - Safety (Information Sheet)
R.S.A. 10 - Description of Window Frames
R.S.A. 11 - How to Build and Install Window and Door Frame
R.S.A. 12 - Water Tables, Corner Boards, Belt Course Types, and Installation
R.S.A. 13 - Side Wall Coverings - Types, and Installation
R.S.A. 14 - Side Wall Coverings (Continued) (Information Sheet)
R.S.A. 15 - Porch Trim - Types and Application
R.S.A. 16 - Front Entrances

Course Outline (Continued)

Unit V - Interior Trim
R.S.A. A - Orientation for Carpentry Apprentice (Information Sheet)
R.S.A. B - How to Use This Course (Information Sheet)
R.S.A. 1 - Insulation
R.S.A. 2 - Description of Wallboard (Information Sheet)
R.S.A. 3 - Wallboard Application (Information Sheet)
R.S.A. 4 - Lath
R.S.A. 5 - Finishing Tools
R.S.A. 6 - Finishing Tools (Continued)
R.S.A. 7 - Finish Hardware
R.S.A. 8 - How to fit Window Sash
R.S.A. 9 - Window and Door Jambs and Trim
R.S.A. 10 - Baseboards and Wall Panels
R.S.A. 11 - Finish Hardwood Floors
R.S.A. 12 - How to Apply Finish Hardware
R.S.A. 13 - Millwork Installation (Information Sheet)
R.S.A. 14 - Kitchen Cabinets, Clothes and Linen Closets, and Miscellaneous Millwork
R.S.A. 15 - Current Information (Information Sheet)

Unit VI - Stairs
R.S.A. 1 - Forms for Concrete Steps
R.S.A. 2 - Framing a Stair Well
R.S.A. 3 - Stairway Framing
R.S.A. 4 - Stair Platforms
R.S.A. 5 - Finish Stairs on Carriages and Housed and Open Stringers
R.S.A. 6 - Newel Posts and Handrails
R.S.A. 7 - The Proper Approach to Stair Stringer Layout

Unit VII - Floor Covering
R.S.A. A - Orientation for Carpentry Apprentice (Information Sheet)
R.S.A. B - How to Use This Course (Information Sheet)
R.S.A. 1 - The Resilient Floor-Covering Products
R.S.A. 2 - Tools for Tile Mechanics
R.S.A. 3 - Preparing the Job for Installation of Floor Covering
R.S.A. 4 - Preparing the Sub-floor
R.S.A. 5 - Laying Sheet Goods Wall to Wall
R.S.A. 6 - Pattern Layout
R.S.A. 7 - Cutting, Fitting, and Laying Lining Felt and Resilient Tile
R.S.A. 8 - Cabinet and Backsplash Covering
R.S.A. 9 - Maintenance of the Tile Floors
R.S.A. 10 - Safety

Course Outline (Continued)

Unit VIII - Miscellaneous
R.S.A. 1 - Temporary Building (Information Sheet)
R.S.A. 2 - Window and Door Screens (Information Sheet)
R.S.A. 3 - Anchor Bolts for Column Bases and Machines (Information Sheet)
R.S.A. 4 - Roof and Bridge Trusses (Information Sheet)
R.S.A. 5 - Dimensions (Information Sheet)
R.S.A. 6 - Estimating Fundamentals
R.S.A. 7 - Foundation Materials
R.S.A. 8 - Framing
R.S.A. 9 - Framing
R.S.A. 10 - Exterior Finish
R.S.A. 11 - Interior Finish
R.S.A. 12 - Estimator's Tables
R.S.A. 13 - Estimating Short Cuts
R.S.A. 14 - Labor Hours Per Unit
R.S.A. 15 - The Union

Unit IX - Advanced Related Information
R.S.A. A - Orientation for Advanced Apprentice (Information Sheet)
R.S.A. B - How to Use This Unit in Advanced Related Information for Carpenters (Information Sheet)
R.S.A. 1 - Forms: Concrete Work
R.S.A. 2 - Lumber Measuring and Selecting
R.S.A. 3 - House Framing Methods
R.S.A. 4 - Floor, Wall Framing
R.S.A. 5 - Roof Types Framing
R.S.A. 6 - Exterior Wall Construction
R.S.A. 7 - Roofing Material Installation
R.S.A. 8 - Thermal-Sound Insulation
R.S.A. 9 - Windows and Doors
R.S.A. 10 - Staircase Building
R.S.A. 11 - Interior Walls and Finishes
R.S.A. 12 - Planning a Home

Unit X - Advanced Blueprint Reading and Estimating
R.S.A. 1 - Blueprint Reading and Estimating
R.S.A. 2 - Rough Framing, Exterior Finish, and Roof Framing
R.S.A. 3 - Interior Finish
R.S.A. 4 - Plan Reading and Estimating for Plan B
R.S.A 5 - Plan Reading and Estimating for Plan B
R.S.A. 6 - Plan Reading and Estimating for Plan B
R.S.A. 7 - Plan Reading and Estimating for Plan B
R.S.A. 8 - Plan Reading and Estimating for Plan B
R.S.A. 9 - Plan Reading and Estimating for Plan C

Course Outline (Continued)

Unit X (Continued)

- R.S.A. 10 - Plan Reading and Estimating for Plan C
- R.S.A. 11 - Plan Reading and Estimating for Plan C
- R.S.A. 12 - Plan Reading and Estimating for Plan C
- R.S.A. 13 - Plan Reading and Estimating for Plan C
- R.S.A. 14 - Plan Reading and Estimating for Plan C

The Electrical Apprentice Course was published in 1952-53 and revised in 1961. It is available in the following forms:

Related Study Assignments
- Book 1 - Units 1, 2, and 3
- Book 2 - Units 4, 5, 6, 7, 8, and 9
- Book 3 - Units 10, 11, 12, and 13
- Book 4 - Units 14, 15, 16, 17, 18, 19, and 20
- Book 5 - Units 21, 22, 23, 24, 25, and Appendix

Test Books
- Book 1 - Units 1, 2, and 3
- Book 2 - Units 4, 5, 6, 7, 8, and 9
- Book 3 - Units 10, 11, 12, and 13
- Book 4 - Units 14, 15, 16, 17, 18, 19, and 20
- Book 5 - Units 21, 22, 23, 24, and 25

Answer Book
- Book 1 - Units 1 - 25

The following instructor's aids are available:
- Progress Charts
- Monthly Reports of Apprentice

The references for the Electrical Apprentice Course are the following:

| Title | Source |
|---|---|
| Welton, Paul L., and Rogers, Wm. W.<br>SHOP MATHEMATICS AT WORK | Silver Burdett Company<br>707 Browder Street<br>Dallas 1, Texas |
| Uhl, Dunlap, and Flynn,<br>INTERIOR ELECTRIC WIRING AND ESTIMATING - RESIDENTIAL | American Technical Society<br>848 East Fifty-Eighth Street<br>Chicago 37, Illinois |
| Richter, H. P.,<br>PRACTICAL ELECTRICAL WIRING | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| National Board of Fire Underwriters,<br>THE NATIONAL ELECTRICAL CODE<br>Pamphlet # 70 | National Board of Fire Underwriters<br>85 John Street |
| The American National Red Cross,<br>FIRST AID TEXTBOOK | Doubleday and Company, Inc.<br>Gareen City, New York |
| Hausmann, Erich,<br>SWOOPE'S LESSONS IN PRACTICAL ELECTRICITY | D. Van Nostrand Company, Inc.<br>120 Alexander Street<br>Princeton, New Jersey |

References (Continued)

| Title | Source |
|---|---|
| Cooke, Nelson M.<br>MATHEMATICS FOR ELECTRICIANS AND RADIOMEN | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Abbott, Arthur L. and Stetka, Frank<br>NATIONAL ELECTRICAL CODE HANDBOOK<br>10th Edition, 1960 | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Graham, Kennard C.,<br>NATIONAL ELECTRICAL CODE AND BLUEPRINT READING, Unit 3 | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| Kruger, Albert M., and Ferry, Trafford J.,<br>CONDUIT BENDING MANUAL, 1939 | C.B.M. Publications<br>6555 77th Place<br>Maspeth, New York |
| Crouse, William H.,<br>ELECTRICAL APPLIANCE SERVICING | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Rosenberg, Robert,<br>ELECTRIC MOTOR REPAIR | Holt, Rinehart and Winston, Inc.<br>383 Madison Avenue<br>New York 17, New York |
| Timbie, W. H.<br>ELEMENTS OF ELECTRICITY<br>3rd Edition, 16th Printing | John Wiley & Sons, Inc.<br>440 Park Avenue South<br>New York 16, New York |
| Rasch, William Edward<br>PRACTICAL ELECTRICAL MATHEMATICS | D. C. Heath and Co.<br>285 Columbus Avenue<br>Boston 16, Massachusetts |
| Gibbs, J. B.<br>TRANSFORMER PRINCIPLES AND PRACTICES<br>1950 Edition | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Crow, Leonard R.<br>LEARNING ELECTRICITY AND ELECTRONICS EXPERIMENTALLY | Educational Publishers, Inc.<br>St. Louis 1, Missouri |
| Nadon, John M. and Gelmine, Bert J.<br>INDUSTRIAL ELECTRICITY | D. Van Nostrand Co., Inc.<br>120 Alexander Street<br>Princeton, New Jersey |

References (Continued)

| Title | Source |
|---|---|
| Van Valkenburgh, Nooger and Neville, Inc.<br>BASIC SYNCHROS AND SERVO-MECHANISMS | John F. Rider Publisher, Inc.<br>480 Canal Street<br>New York 13, New York |
| GENERAL DESCRIPTION FOR D.C. VARIABLE DRIVE | Fidelity Instrument Corp.<br>1000 E. Boundary Avenue<br>York, Pennsylvania |
| DESCRIPTION OF OPERATION AND SERVICE INSTRUCTIONS, MODEL F-29B SPEED REGULATOR | Fidelity Instrument Corp.<br>1000E. Boundary Avenue<br>York, Pennsylvania |
| WESTINGHOUSE LIGHTING HANDBOOK | Westinghouse Electric Corp.<br>Lamp Division<br>Springfield, Massachusetts |

A detailed outline of the Electrical Apprentice Course follows:

BOOK I - Electrical Apprentice

Unit I - Tools, Materials, and Their Uses

R.S.A. 1 How to Use This Course of Study (Information Sheet) No Test

R.S.A. 2 The Apprentice and His Job (Information Sheet)

R.S.A. 3 American Red Cross Standard First Aid Course (Information Sheet)

R.S.A. 4 Care and Use of Hand Tools and Equipment (Information Sheet)

R.S.A. 5 Common Fractions (Mathematics)

R.S.A. 6 Care and Use of Power Operated Tools (Information Sheet)

R.S.A. 7 Types of Fasteners (Information Sheet)

R.S.A. 8 Decimal Fractions (Mathematics)

R.S.A. 9 Introduction to the National Electrical Code

R.S.A. 10 Types of Wires and Cable

Course Outline (Continued)

R.S.A. 11 Use of American Wire Gauge and the Micrometer (Mathematics)

R.S.A. 12 Raceways and Fittings

R.S.A. 13 Measurements (Mathematics)

R.S.A. 14 Wire Connections and Soldering

R.S.A. 15 Using Letters as Numbers (Mathematics)

R.S.A. 16 Employer and Employee Organization (Information Sheet)

Unit II - Fundamental Theory of Electricity

R.S.A. 1 Electron Theory

R.S.A. 2 Literal Numbers, Addition and Subtraction (Mathematics)

R.S.A. 3 Static Electricity (Information Sheet)

R.S.A. 4 Multiplication and Division (Mathematics)

R.S.A. 5 Sketching and Blueprint; Electrical Symbols #1 (Information Sheet)

R.S.A. 6 Exponents, Square Root, and Units (Mathematics)

R.S.A. 7 Electric Current and Electron Flow

R.S.A. 8 Equations (Mathematics)

R.S.A. 9 Voltage, Current, Resistance and Conductance (Information Sheet)

R.S.A. 10 Properties of Magnets and Magnetic Fields

R.S.A. 11 Electromagnetism

R.S.A. 12 Means of Developing Electromotive Forces

R.S.A. 13 Primary Cells

R.S.A. 14 Secondary Cells

Course Outline (Continued)

Unit II (Continued)

R.S.A. 15 Ratio and Proportion (Mathematics)

R.S.A. 16 Sketching and Blueprint; Electrical Symbols #2

Unit III - Principles of Direct Current

R.S.A. 1 Ohm's Law--Series Circuits (Mathematics)

R.S.A. 2 Ohm's Law--Parallel Circuits (Mathematics)

R.S.A. 3 Ohm's Law--Series-Parallel Circuits (Mathematics)

R.S.A. 4 Power in Direct Current Circuits

R.S.A. 5 Problems Concerning Cells (Mathematics)

R.S.A. 6 Circuit Sketching, Cells in Series-Parallel

R.S.A. 7 Low Voltage Signal Circuits

R.S.A. 8 Simple Bell Circuits (Circuit Sketching)

R.S.A. 9 Fuses and Circuit Breakers

R.S.A. 10 Principles of Dynamo-Electric Machines

R.S.A. 11 Problems Concerning Conductors

BOOK II - Electrical Apprentice

Unit IV - Principles of Alternating Current

R.S.A. 1 Introduction to Trigonometry (Mathematics)

R.S.A. 2 Trigonometric Functions (Mathematics)

R.S.A. 3 Tables of Functions (Mathematics)

R.S.A. 4 Solution of Right Triangles (Mathematics)

R.S.A. 5 Periodic Functions (Mathematics)

R.S.A. 6 Elementary Plane Vectors (Mathematics)

Course Outline (Continued)

Unit IV (Continued)

- R.S.A. 7 Alternating Currents and Voltages (Information Sheet)
- R.S.A. 8 Inductance (Information Sheet)
- R.S.A. 9 Capacitance (Information Sheet)

Unit V - Alternating-Current Circuits

- R.S.A. 1 Resistance and Power in AC Circuits (Information Sheet)
- R.S.A. 2 Inductance in AC Circuits (Information Sheet
- R.S.A. 3 Capacitance in AC Circuits (Information Sheet)
- R.S.A. 4 Impedance in AC Series Circuits (Information Sheet)
- R.S.A. 5 Resistance, Inductance and Capacitance in AC Parallel Circuits (Information Sheet)
- R.S.A. 6 Series-Parallel AC Circuits (Information Sheet)
- R.S.A. 7 Polyphase Circuits (Information Sheet)

Unit VI - Motors and Generators

- R.S.A. 1 Principles of Dynamo-Electric Machine (Information Sheet)
- R.S.A. 2 Direct-Current Generators (Information Sheet)
- R.S.A. 3 Direct-Current Motors (Information Sheet)
- R.S.A. 4 Alternating-Current Motors (Information Sheet)

Unit VII -Transformers

- R.S.A. 1 Power Transformers (Information Sheet)
- R.S.A. 2 Instrument Transformers (Information Sheet)

Unit VIII - Fundamentals of Meters

- R.S.A. 1 Direct-Current Meters (Information Sheet)
- R.S.A. 2 Alternating-Current Meters (Information Sheet)

Course Outline (Continued)

Unit VIII (Continued)

- R.S.A. 3 Wattmeters and Watthour-meters (Information Sheet)
- R.S.A. 4 Care and Use of Portable Meters and Indicating Devices (Information Sheet)

Unit IX - Lighting

- R.S.A. 1 Facts About Lighting (Part 1) (Information Sheet)
- R.S.A. 2 Facts About Lighting (Part 2) (Information Sheet)
- R.S.A. 3 Types of Lamps (Information Sheet)
- R.S.A. 4 Computing Electric Light and Power Bills (Information Sheet)

BOOK III - Electrical Apprentice

Unit X - Wiring Methods

- R.S.A. 1 General Provisions of the National Electrical Code (Information Sheet)
- R.S.A. 2 General Requirements for Wiring Methods (Information Sheet)
- R.S.A. 3 Types of Boxes, Box Covers, Box Extensions and Methods of Installation (Information Sheet)
- R.S.A. 4 Polarity Identification of Systems and Circuits (Information Sheet)
- R.S.A. 5 Types of Cables and Fittings (Information Sheet)
- R.S.A. 6 Open Wiring on Insulators and Concealed Knob and Tube Work (Information Sheet)
- R.S.A. 7 Branch Circuits and Service Entrance (Information Sheet)
- R.S.A. 8 Non-metallic Cable Wiring (Information Sheet)
- R.S.A. 9 Armored Cable Wiring (Information Sheet)

Course Outline (Continued)

Unit X (Continued)

R.S.A. 10 Diagramming and Wiring Plans (Information Sheet)

R.S.A. 11 Installing Surface Metal Raceway (Information Sheet)

R.S.A. 12 Installing Conduit (Information Sheet)

R.S.A. 13 Methods of Pulling Conductors in Raceways (Information Sheet)

R.S.A. 14 Use of NEC Tables for Calculating the Number of Conductors in Conduit or Tubing (Information Sheet)

R.S.A. 15 Bending Conduit and Tubing with Hand Benders (Information Sheet)

R.S.A. 16 Bending Conduit and Tubing on Hydraulic and Screw Jack Machines (Information Sheet)

R.S.A. 17 Building Structures and Architectural Symbols (Information Sheet)

R.S.A. 18 Wiring in Hazardous Locations (Information Sheet)

R.S.A. 19 Installing Wireways, Busways, Auxiliary Gutters, and Cellular Metal Floor Raceways (Information Sheet)

R.S.A. 20 Commercial Garages, Service Stations, and Bulk Storage Plants (Information Sheet)

R.S.A. 21 Installation Practice of Lighting Fixtures (Information Sheet)

Unit XI - Low Voltage Circuits

R.S.A. 1 Remote-Control, Low-Energy Power, Low-Voltage Power (Information Sheet)

R.S.A. 2 Introduction to Annunciators (Information Sheet)

R.S.A. 3 Design of Basic Relay Annunciators(Information Sheet)

R.S.A. 4 Remote Control Switching (Information Sheet)

R.S.A. 5 Intercommunicating Telephones (Information Sheet)

Course Outline (Continued)

Unit XII - Appliance-D.C. Motors

- R.S.A. 1 Cooking Appliances (Information Sheet)
- R.S.A. 2 Electric Hot Water Heaters and Gas Furnace Controls (Information Sheet)

Unit XIII- Direct-Current Motors and Controllers

- R.S.A. 1 Direct-Current Motors (Information Sheet)
- R.S.A. 2 Direct-Current Controllers (Information Sheet)

BOOK IV - Electrical Apprentice

Unit XIV - Alternating Current Motors and Controllers

- R.S.A. 1 Split-Phase Motors (Information Sheet)
- R.S.A. 2 Capacitor Motors (Information Sheet)
- R.S.A. 3 Repulsion Type Motors (Information Sheet)
- R.S.A. 4 Three Phase Motors (Information Sheet)
- R.S.A. 5 N.E.C. Specifications for Motors and Controllers (Information Sheet)
- R.S.A. 6 Wiring for Motors (Information Sheet)
- R.S.A. 7 Across-the-line Magnetic Starters Information Sheet)
- R.S.A. 8 Reversing Magnetic Starters (Information Sheet)
- R.S.A. 9 Reduced Voltage Starters (Information Sheet)
- R.S.A. 10 Drum, Two-Speed and Quick-Stop Controllers (Information Sheet)
- R.S.A. 11 Synchronous Drive and Indicating Systems (Information Sheet)

Unit XV - Alternators and Distribution

- R.S.A. 1 Alternators (Information Sheet)
- R.S.A. 2 Synchronizing and Phase Alternators (Information Sheet)

Course Outline (Continued)

## Unit XVI -Transformer Principles and Practices

R.S.A. 1 Introduction to Transformers and Transformer Ratios (Information Sheet)

R.S.A. 2 Checking Polarity of Transformers (Information Sheet)

R.S.A. 3 Single Phase Transformer Connections (Information Sheet)

R.S.A. 4 Three Phase Transformer Connections (Information Sheet)

R.S.A. 5 Special Application of Transformers (Information Sheet)

R.S.A. 6 Transformer Oil, and Oil Maintenance (Information Sheet)

## Unit XVII - Meters and Metering

R.S.A. 1 Metering Single Phase Circuits Without Instrument Transformers (Information Sheet)

R.S.A. 2 Metering Single Phase Circuits With Instrument Transformers (Information Sheet)

R.S.A. 3 Metering Polyphase Circuits With and Without Instrument Transformers (Information Sheet)

## Unit XVIII - Fundamental Electronics

R.S.A. 1 Vacuum Tubes as Rectifiers (Information Sheet)

R.S.A. 2 Solid State Rectifiers (Information Sheet)

R.S.A. 3 Rectifier Filters (Information Sheet)

R.S.A. 4 Triode Tube (Information Sheet)

R.S.A. 5 Operation Gas Filled Tubes (Information Sheet)

R.S.A. 6 Thyratron Tube (Information Sheet)

R.S.A. 7 Photo-Cells and Controls (Information Sheet)

R.S.A. 8 Electronic Motor Controls (Information Sheet)

Course Outline (Continued)

Unit XVIII (Continued)

- R.S.A. 9 Magnetic Amplifier Control in D. C. (Information Sheet)
- R.S.A. 10 Magnetic Amplifier Control A.C. (Information Sheet)

Unit XIX - Welding and Cutting

- R.S.A. 1 Functions and Operating Principles of Oxy-Acetylene, Regulators, Blowpipes, and Accessories (Information Sheet)
- R.S.A. 2 Setting Up Oxy-Acetylene Equipment (Information Sheet)
- R.S.A. 3 Oxy-Acetylene Welding (Information Sheet)
- R.S.A. 4 Oxy-Acetylene Cutting (Information Sheet)
- R.S.A. 5 Characteristics of Arc Welding (Information Sheet)
- R.S.A. 6 Types of Electrodes (Information Sheet)
- R.S.A. 7 Characteristics of Inert Gas Welding (Information Sheet)

Unit XX - Protective Relaying Principles and Practices

- R.S.A. 1 General (Information Sheet)
- R.S.A. 2 Differential Protection (Information Sheet)
- R.S.A. 3 Line Protection (Information Sheet)
- R.S.A. 4 Definitions (Information Sheet)

BOOK V - Electrical Apprentice

Unit XXI - Illumination and Wiring Commercial and Industrial Buildings

- R.S.A. 1 Illumination Design Data for Interiors (Information Sheet)
- R.S.A. 2 Calculations for Illuminating an Industrial Shop (Information Sheet)

Course Outline (Continued)

Unit XXI (Continued)

| | |
|---|---|
| R.S.A. 3 | Calculating Wiring for an Industrial Shop (Information Sheet) |
| R.S.A. 3A | Calculating, Wiring, and Illumination for Paint Shop and Finishing Room (Information Sheet) |

Unit XXII - Fluorescent Lamps

| | |
|---|---|
| R.S.A. 1 | Characteristics and Working Principles of Fluorescent Lamps (Information Sheet) |
| R.S.A. 2 | Circuit Sketching; Fluorescent Lamps (Information Sheet) |
| R.S.A. 3 | N.E.C. Requirements for Lighting Fixtures, Signs and Outline Lighting (Information Sheet) |

Unit XXIII - Substations

| | |
|---|---|
| R.S.A. 1 | Types and Uses of Substations (Information Sheet) |
| R.S.A. 2 | Schematic and Pictorial Illustrations of Substations (Information Sheet) |
| R.S.A. 3 | N.E.C. Requirements on Transformers and Circuits and Conductors Operating at More Than 600 Volts Between Conductors (Information Sheet) |

Unit XXIV - Special Problems

| | |
|---|---|
| R.S.A. 1 | Calculating Necessary Data for Wiring Wound Rotor Motor (Information Sheet) |
| R.S.A. 2 | Estimating Material for Roughing-in A Single Family Dwelling (Information Sheet |
| Appendix | Steps to Safety |

The General Apprentices Course was written in 1954. It is available in the following form:

- Book
  - Unit I
- Book
  - Unit II

- Test Book
  - Book
    - Unit I
  - Book
    - Unit II

- Answer Books
  - Book
    - Unit I
  - Book
    - Unit II

The following instructor's aids are available:
- Progress Chart

A detailed outline of the General Apprentices Course follows:

R.S.A. 1 - Getting and Holding a Job (Information Sheet)

R.S.A. 2 - Qualities Essential to Success (Information Sheet)

R.S.A. 3 - Workmen's Compensation Law in Louisiana (Information Sheet)

R.S.A. 4 - Social Security Act

R.S.A. 5 - Capital, Labor, and Management

R.S.A. 6 - Employer and Employee Organizations (Information Sheet)

R.S.A. 7 - Everyday Safety (Information Sheet)

R.S.A. 8 - Skilled Training for Workmen (Information Sheet)

R.S.A. 9 - Keeping Up With Occupational Changes (Information Sheet)

R.S.A. 10 - Apprenticeship (Information Sheet)

R.S.A. 11 - Insurance (Information Sheet)

R.S.A. 12 - Business Letters (Information Sheet)

Course Outline (Continued)

R.S.A. 13 - Personal Checks and Drafts

R.S.A. 14 - Keeping Accounts

R.S.A. 15 - Making and Reading Line Graphs

Unit II - Work Habits

R.S.A. 1 - Work Habits (Information Sheet)

R.S.A. 2 - Dependability (Information Sheet)

R.S.A. 3 - Orderliness (Information Sheet)

R.S.A. 4 - Method (Information Sheet)

R.S.A. 5 - Organization (Information Sheet)

R.S.A. 6 - Accuracy (Information Sheet)

R.S.A. 7 - Neatness (Information Sheet)

R.S.A. 8 - Respect for Materials (Information Sheet)

R.S.A. 9 - Economical Use of Materials (Information Sheet)

R.S.A. 10 - Ability to Solve Problems (Information Sheet)

R.S.A. 11 - Part I - Safety (Information Sheet)
Part II - Safety (Information Sheet)

R.S A. 12 - Cooperation (Information Sheet)

R.S.A. 13 - Miscellaneous Work Habits (Information Sheet)

Units I and II of Machinist Apprentice was published in 1949, Unit III 1950, and Units IV through X in 1952. It is available in the following forms:

Related Study Assignments, Mathematics and Blueprint
- Book 1 - Units I and II
- Book 2 - Unit III
- Book 3 - Units IV and V
- Book 4 - Units VI through X

Test Books
- Book 1 - Units I and II
  Final Examination
- Book 2 - Unit III
  Final Examination
- Book 3 - Units IV and V
- Book 4 - Units VI through IX - No Test on Unit X

Answer Books
- Book 1 - Units I and II
- Book 2 - Unit III
- Book 3 - Units IV and V
- Book 4 - Units VI through IX

The following instructor's aids are available:
- Progress Charts
- Monthly Report forms

The references for the Machinist Apprentice Course are the following:

| Title | Source |
|---|---|
| Axelrod Aaron,<br>MACHINE SHOP MATHEMATICS<br>1947 | McGraw-Hill Book Company<br>330 West 42nd Street<br>New York 36, New York |
| Burghardt, Henry D.,<br>MACHINE TOOL OPERATION,<br>Part I 1941 and Part II | McGraw-Hill Book Company<br>330 West 42nd Street<br>New York 36, New York |
| Giachino, J. W., and Feirer, John L.<br>BASIC BENCH-METAL PRACTICE AND<br>PRECISION MEASURING, 1943 | Chas. A. Bennett Co., Inc.<br>237 N. Monroe Street<br>Peoria, Illinois |
| Jones, J. D.,<br>MACHINE SHOP TRAINING COURSE,<br>Volume 1, Second Edition | The Industrial Press<br>148 Lafayette Street<br>New York 13, New York |
| Rogers, W. W., and Welton, P. L.,<br>BLUEPRINT READING AT WORK, 1944 | Silver Burdett Company<br>45 East 17th Street<br>New York 3, New York |

References (Continued)

| Title | Source |
|---|---|
| Ihne, R. W., and Streeter,<br>MACHINE TRADES BLUEPRINT READING,<br>1948 | American Technical Society<br>848 East Fifty-eighth St.<br>Chicago 37, Illinois |
| SHAPER WORK | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| MILLING MACHINE WORK | Delmar Publishers, Inc.<br>Mountainview Avenue<br>Albany 5, New York |
| Smith,<br>ADVANCED MACHINE WORK | Industrial Education Book Co.<br>Boston, Massachusetts |
| Oberg and Jones,<br>MACHINERY'S HANDBOOK,<br>15th Edition | The Industrial Press<br>148 Lafayette Street<br>New York 36, New York |

A detailed outline of the Machinist Apprentice Course follows:

Unit I - Bench and Floor

R.S.A. 1: Layout Tools and Their Uses
Math: The Machinist's Rule
Blueprint Reading: How to Understand Blueprints

R.S.A. 2: Files and Filing
Math: Angular Measurement
Blueprint Reading: Three-View Drawings: Horizontal and Vertical Surface

R.S.A. 3: Chisels and Their Uses
Math: Cutting Stock
Blueprint Reading: Three-View Drawings: Slanting Surfaces

R.S.A. 4: Heat Treatment of Steel
Math: Expansion of Metals
Blueprint Reading: Three-View Drawings: Hidden Lines

R.S.A. 5: Hack Saws and Sawing
Math: Weight of Stock
Blueprint Reading: Three-View Drawing Scales

Course Outline (Continued)

Unit I - Bench and Floor (Continued)

R.S.A. 6: Reamers and Reaming
Math: Tap Drill Sizes
Blueprint Reading: Two-View Drawings: Curved Surfaces

R.S.A. 7: Die Threading and Tapping
Math: Tap Drill Sizes
Blueprint Reading: Two-View Drawings: Curved Surface

R.S.A. 8: Scrapers and Scraping
Math: Solution of Formulas
Blueprint Reading: Two-View Drawings: Decimal Tolerance

R.S.A. 9: Babbitting
Math: The Circle
Blueprint Reading: Two-View Drawings: Angular Tolerances

R.S.A. 10: Types of Drills
Math: Geometric Construction
Blueprint Reading: One-View Drawings

R.S.A. 11: Fits, Limits, and Tolerance
Math: The Rectangle
Blueprint Reading: Bracket Blueprint

R.S.A. 12: Care and Use of Grinders
Math: Speed of Pulleys
Blueprint Reading: Sectional Drawings: Full Section

R.S.A. 13: The Power Hack Saw
Math: The Right Triangle
Blueprint Reading: Sectional Drawings: Half Section

R.S.A. 14: Color Code of Steel
Blueprint Reading: Sectional Drawings: Detail View

R.S.A. 15: Soldering
Math: Belting

Course Outline (Continued)

Unit I - Bench and Floor (Continued)

R.S.A. 16: Abrasives and Grinding Wheels
Math: Power of Belting

R.S.A. 17: Producing, Processing, and Identifying Iron and Steel
Math: Review Problems on Belting

Unit II - Drill Press

R.S.A. 1: Types of Drill Presses and Their Operation
Blueprint Reading: Sectional Drawings: Special Types of Sections

R.S.A. 2: Speed and Feeds of a Drill Press
Math: Speed of Drills
Blueprint Reading: Screw Fastening: External Threads

R.S.A. 3: Sharpening Drills
Math: Drill Press Feed
Blueprint Reading: Screw Fastenings: Internal Threads

R.S.A. 4: Drill Chucks and Sleeves
Blueprint Reading: Screw Fastenings: Detail Thread Problems

R.S.A. 5: Holding the Work
Blueprint Reading: Auxiliary View Drawings

R.S.A. 6: Coolants
Math: Liquid Measure
Blueprint Reading: T-Slide Bracket

R.S.A. 7: Drilling
Blueprint Reading: Assembly Drawing

R.S.A. 8: Reamers and Reaming
Math: Principles of Micrometer
Blueprint Reading: Drill Jig

R.S.A. 9: Counterboring, Countersinking, Boring, and Tapping
Math: Mechanical Work and Power
Blueprint Reading: Milling Fixture for T-Slot Nut

Bibliography: Required Textbooks

Course Outline (Continued)

Unit III - Lathe

R.S.A. 1: Types of Lathes and Identification of Parts
Blueprint Reading: Introduction

R.S.A. 2: Principles of Lathe
Math: Shop Arithmetic

R.S.A. 3: Care and Use of the Lathe
Math: Cutting Speed

R.S.A. 4: Lathe Holding Devices
Math: Cutting Time
Blueprint Reading: Introduction

R.S.A. 5: Center Drilling and Care of Lathe Centers
Math: Review Problems on Feeds and Speeds

R.S.A. 6: Cutting Tools and Their Holding Devices
Math: Cutting Stock
Blueprint Reading: Isometric and Three View Sketching

R.S.A. 7: Straight Turning
Math: Simple Gearing
Blueprint Reading: Rectangular Objects

R.S.A. 8: Shoulder Turning, Facing and Necking
Math: Compound Gearing
Blueprint Reading: The Rectangular Object

R.S.A. 9: Knurling
Math: The Vernier Caliper

R.S.A. 10: Math: Shop Trigonometry (Right Triangle)

R.S.A. 11: Turning Tapers and Angles with the Compound Rest
Math: Cutting Tapers Using the Compound Rest

R.S.A. 12: Turning Tapers: Tailstock Offset Method
Math: Calculation of Tapers and Tailstock Offset

R.S.A. 13: Turning Tapers: Taper Attachment
Math: Cutting Tapers by Use of Taper Attachment

R.S.A. 14: Drilling and Reaming
Blueprint Reading: Rectangular Objects

Course Outline (Continued)

Unit III - Lathe (Continued)

R.S.A. 15: Filing and Polishing
Blueprint Reading: Invisible Surfaces

R.S.A. 16: Boring and Counterboring
Blueprint Reading: Invisible Surfaces

R.S.A. 17: Undercutting and Back-facing
Blueprint Reading: Start Surfaces

R.S.A. 18: Tapping
Math: The American Standard Screw Thread System
Blueprint Reading: Round Objects

R.S.A. 19: Taper Boring
Blueprint Reading: Round Objects

R.S.A. 20: Screw Thread Standards
Blueprint Reading: Auxiliary Views

R.S.A. 21: Thread Cutting (V-Shape)
Math: Simple Lathe Gearing for Thread Cutting

R.S.A. 22: Threading (Acme and Square) Single and Multiple
Math: Square and Acme Thread Calculations

R.S.A. 23: Internal Threading
Math: Tap Drill Sizes for Square and Acme Threads
Blueprint Reading: Chuck - Working Drawing

R.S.A. 24: Spring Winding in a Lathe
Math: Shop Trigonometry (Equilateral Triangle)
Blueprint Reading: Automatic Oiler - Working Drawing

R.S.A. 25: Interchangeable Manufacturer and Classes of Fits for Assembled Machine Parts
Math: Shop Trigonometry (Isosceles Triangle)
Blueprint Reading: Steering Sector Arm No. 1 - Working Drawing

R.S.A. 26: Cutting Off Bar Stock in a Lathe
Math: Cutting Threads by Compound Gearing
Blueprint Reading: Bar - Working Drawing

R.S.A. 27: Crankshaft Turning
Math: Time Measurement (Wages)
Bibliography: Books Required For Each Apprentice

Course Outline (Continued)

Unit IV - Shaper

R.S.A. 1: Name of Parts

R.S.A. 2: Shaper Construction
Math: Cutting Speeds of Planers and Shapers
Blueprint Reading: Drilling Fixture

R.S.A. 3: Planer Construction
Math: Strokes Per Minute and Cutting Speed

R.S.A. 4: Shaper and Planer Cutting Tools
Math: Planer and Shaper Feed

R.S.A. 5: Shaper and Planer Work Holding Devices
Math: Practical Measurements (Parallelogram)
Blueprint Reading: Shift Fork

R.S.A. 6: Causes of Inaccurate Work
Math: Practical Measurements (Scalene Triangle)
Blueprint Reading: Die

R.S.A. 7: Machining Flat and Horizontal Surfaces
Math: Review Problems

R.S.A. 8: Vertical, Angular, Contour, and Form Planing
Math: Shop Trigonometry (Review Problems)

R.S.A. 9: Slotting and Keyseating
Math: Shop Trigonometry (The Sine and Cosine Law)

R.S.A. 10: How to Cut Serrations
Math: Shop Trigonometry (General Review Problems)

Unit V - Milling Machine

R.S.A. 1: Types, Sizes, and Uses of Milling Machines
Math: Milling Machine Cutting Speeds

R.S.A. 2: Care and Maintenance of the Milling Machine
Math: Milling Machine Feed

R.S.A. 3: Types of Cutter and Work Holding Devices

R.S.A. 4: Proper Care and Use of Cutter and Work Holding Devices

R.S.A. 5: Types of Cutters for the Milling Machine

Course Outline (Continued)

Unit V Milling Machine (Continued)

- R.S.A. 6: Milling Machine Attachments
- R.S.A. 7: Coolants and Their Use
- R.S.A. 8: Milling Flat Surfaces
  - Math: Milling Round Stock Into Rectangular Bars
- R.S.A. 9: Milling Ends and Faces
- R.S.A. 10: Sawing, Slotting, and Keyway Milling
- R.S.A. 11: Form Milling
- R.S.A. 12: Angular Milling
- R.S.A. 13: Gang Milling
- R.S.A. 14: Dividing Head and Foot Stock
  - Math: Direct and Simple Indexing
- R.S.A. 15: Spur Gear Rules and Formulas
  - Blueprint Reading: Spur Gear
- R.S.A. 16: Milling Spur Gears
  - Math: Calculations for Spur Gears
  - Blueprint Reading: Spur Gear
- R.S.A. 17: Bevel Gears
  - Math: Calculations for Bevel Gears
  - Blueprint Reading: Bevel Gear
- R.S.A. 18: Worm and Gear
  - Math: Calculations for Worm Gears
- R.S.A. 19: Helical Milling
- R.S.A. 20: Graduating
  - Math: Graduating
- R.S.A. 21: Milling Helical Gears

Bibliography: Required Textbooks for Shaper and Milling Machine

Course Outline (Continued)

Unit VI - Grinding

R.S.A. 1: Grinding Machine Construction
Math: Dimensions, Areas and Volumes of Geometrical Figures

R.S.A. 2: Grinding Wheels

R.S.A. 3: Principles of Grinding

R.S.A. 4: Cylindrical Grinding
Math: Figuring Tapers

R.S.A. 5: Surface Grinding

R.S.A. 6: Internal Grinding

R.S.A. 7: Grinding Milling Cutters and Reamers

Unit VII - Turret Lathe

R.S.A. 1: Machine Construction and Work Methods
Math: Standard Screw Threads

Unit VIII - Welding

R.S.A. 1: Functions and Operating Principles of Oxy-Acetylene Regulators, Blowpipes, and Accessories

R.S.A. 2: Setting Up Oxy-Acetylene Equipment

R.S.A. 3: Oxy-Acetylene Cutting

R.S.A. 4: Oxy-Acetylene Welding

R.S.A. 5: Characteristics of Arc Welding

R.S.A. 6: Types of Electrodes

Unit IX - General Information

R.S.A. 1: Principles of Bearings

R.S.A. 2: Belts and Pulleys

R.S.A. 3: Cutting Oils and Compounds

R.S.A. 4: Allowance and Tolerances for Fits
Math: Gear Problems

Course Outline (Continued)

Unit IX - General Information (Continued)

R.S.A. 5: Rigging

R.S.A. 6: Band Sawing Machines

R.S.A. 7: Aligning Machine

R.S.A. 8: Metal Spraying

R.S.A. 9: Machine Tools Today

R.S.A. 10: Personal and Social Problems

Unit X - Horizontal Boring, Drilling & Milling Machine

R.S.A. 1: Machine Fundamentals

R.S.A. 2: Basic Operations

R.S.A. 3: Work Methods

The Pipe Fitter Apprentice Course was published in 1952. It is available in the following forms:

Book 1
  Units I - VII
Book 2
  Unit VIII
Book 4
  Units X - XIII

Test Book
  Book 1
    Units I - VII

The following instructor's aids are available:
  Wall Progress Chart

The references for Pipe Fitter Apprentice Course are the following:

| Title | Source |
|---|---|
| Heisler, W. Fred,<br>ELEMENTARY SCIENCE APPLIED TO PETROLEUM PRODUCTION AND REFINING | Oklahoma A & M Book Store<br>Oklahoma A & M College<br>Oklahoma |
| Castle, Drew W.,<br>PROBLEMS IN BLUEPRINT READING | Chas. A. Bennett Co., Inc.<br>Peoria, Illinois |
| Wolfe and Phelps,<br>PRACTICAL SHOP MATHEMATICS<br>3rd Ed. | McGraw-Hill Book Co.<br>330 West 42nd Street<br>New York 36, New York |

A detailed outline of the Pipe Fitter Apprentice Course follows:

Book 1: Unit 1 - First Aid

To be taught using Bureau of Mines 10 hr. First Aid Course.

Unit 2: Human Relations

R.S.A. 1: Capital, Labor, and Management
R.S.A. 2: Social Security Act
R.S.A. 3: Workmen's Compensation
R.S.A. 4: Attitudes and Behavior
R.S.A. 5: Skilled Training for Workers
R.S.A. 6: Interdependence of Employers and Employees

Course Outline (Continued)

Book 1: Unit 3 - Everyday Safety

R.S.A. 1: General Safety

Unit 4: Plant operation, History and organization

To be taught by Plant Officials

Unit 5: Physics

R.S.A. 1: Matter and Properties of Matter
R.S.A. 2: Weights, Measures, and Strength of Materials
R.S.A. 3: Motion, Force, Work, and Leverage
R.S.A. 4: Mechanical Devices, Power and Friction
R.S.A. 5: Liquids and Gases
R.S.A. 6: Heat and Transmission of Heat
R.S.A. 7: Expansion, Contraction, Melting, Freezing, Vaporization, and Condensation
R.S.A. 8: Magnetism and Electricity

Unit 6: Chemistry

R.S.A. 1: Principles of Chemistry and Common Elements
R.S.A. 2: Compounds
R.S.A. 3: Acids, Bases, and Salts
R.S.A. 4: Combustion, Safety, and terms

Unit 7: Refinery Metals

R.S.A. 1: Types of Metals

Book 2: Unit 8 - Mechanical Drawing

R.S.A. 1: Beginning Drawing
R.S.A. 2: Methods of Drawing
R.S.A. 3: Three View Drawing
R.S.A. 4: Three View Problems
R.S.A. 5: Sections
R.S.A. 6: Dimensions and Notes
R.S.A 7: Lettering and Missing Lines
R.S.A. 8: Drawing Exercises
R.S.A. 9: Drawing Exercises and Auxiliary Views
R.S.A. 10: Geometrical Construction
R.S.A 11: Projection Study
R.S.A. 12: Pictorial Drawing
R.S.A. 13: Layout
R.S A. 14: Layout (Continued)
R.S A. 15: Layout (Continued)

Course Outline (Continued)

Book 2: Unit 8 (Continued)

R.S.A. 16: Layout for Eccentric Reducer
R.S.A. 17: Pipe Sketching
R.S.A. 18: Pipe Drawing
R.S.A. 19: Pipe Bends and Assemblies

Book 4: Unit 10 - Arithmetic

R.S.A. 1: Common Fractions
R.S.A. 2: Decimals
R.S.A. 3: Percentage
R.S.A. 4: Interest and Taxes

Unit 11 - Algebra

R.S.A. 1: Positive and Negative Numbers and Grouping Symbols
R.S.A. 2: Addition, Subtraction, Simple Equations
R.S.A. 3: Ratio and Proportion
R.S.A. 4: Square Root
R.S.A. 5: Formulas and Equations

Unit 12 - Beginning Geometry

R.S.A. 1: Beginning Geometry
R.S.A. 2: Geometry
R.S.A. 3: The Right Triangle
R.S.A. 4: The Right Triangle (Cont'd)
R.S.A. 5: The Circle

Unit 13 - Trigonometry

R.S.A. 1: Beginning Trigonometry
R.S.A. 2: Pipe Layout

The Plumbing and Pipe Fitting Industry was published in 1953-1954. It is available in the following forms:

Related Study Assignments
- Book I - Unit I - General Course
- Book II - Unit I - General Course
- Units II, III, IV & V
- Units VI & VII
- Units VIII, IX, X, & XI
- Units XII, XIII, XIV, XV, & XVI

Test Books
- Test Book for Unit I
- Test Book for Units II, III, IV & V
- Test Book for Units VI & VII
- Test Book for Units VIII, IX, X, & XI
- Test Book for Units XII, XIII, XIV, XV, & XVI

Answer Book
- There is an answer key for each test book

The following instructor's aids are available.
- Class Progress Chart (Pad)
- Monthly Report Blanks (Pad)

The references for the Plumbing and Pipe Fitting Industry are listed below.

| Title | Source |
|---|---|
| Dalzell<br>BUILDING TRADES BLUEPRINT READING, 1950 | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| Matthias, A. J.,<br>HOW TO DESIGN AND INSTALL PLUMBING | American Technical Society<br>848 East 58th Street<br>Chicago 37, Illinois |
| INSTRUCTION MANUAL FOR STEAMFITTING APPRENTICES, Volume I | Heating, Piping and Air Conditioning Contractors National Association<br>1250 Avenue of the Americas<br>New York 20, New York |
| LEAD WORK FOR MODERN PLUMBING | Lead Industries Association<br>60 East 42nd Street<br>New York 17, New York |

References (Continued)

| Title | Source |
|---|---|
| HEATING VENTILATING AIR CONDITIONING GUIDE, 17th Edition | American Society of Heating and Ventilating Engineers<br>51 Madison Avenue<br>New York, New York |
| Crosby-Fiske-Forster HANDBOOK OF FIRE PROTECTION | National Fire Protection Association<br>Boston, Massachusetts |
| REGULATIONS FOR THE INSTALLATION OF STANDPIPE AND HOSE SYSTEMS | National Fire Protection Association<br>Boston, Massachusetts |

A detailed outline of The Plumbing and Pipe Fitting Industry follows.

Unit I

- R.S.A. A - Background of the Plumbing Industry
- R.S.A. B - Development of Steam
- R.S.A. C - History of Refrigeration and Air Conditioning
- R.S.A. I - Introduction to Plumbing and Pipe Fitting Industry
  - Mathematics: Linear Measurement
  - Blueprint Reading: Shapes of Surfaces and Solids
- R.S.A. 2 - Measuring and Layout Tools
  - Mathematics: Rule Practice
  - Blueprint Reading: Elevation Views
- R.S.A. 3 - Wood Boring Tools
  - Mathematics: Rule Practice
  - Blueprint Reading: Elevations
- R.S.A. 4 - Wrenches and Utility Tools
  - Mathematics: Addition of Rule Graduations
  - Blueprint Reading: Elevations
- R.S.A. 5 - Metal Cutting Tools
  - Mathematics: Subtraction of Scale Measurements
  - Blueprint Reading: Elevations
- R.S.A. 6 - Driving Tools
  - Mathematics: Addition of Whole Numbers
  - Blueprint Reading: Plan Views
- R.S.A. 7 - Drilling Holes in Metal
  - Mathematics: Subtraction of Whole Numbers
  - Blueprint Reading: Symbols for Elevations
- R.S.A. 8 - Punching Holes in Metal
  - Mathematics: Multiplication of Whole Numbers
  - Blueprint Reading: Symbols for Elevations

Outline (Continued)

Unit I (Continued)

R.S.A. 9 - Cutting, Reaming, and Threading Tools
Mathematics: Division of Whole Numbers
Blueprint Reading: Symbols for Elevations

R.S.A. 10- Tubing Tools
Mathematics: Reducing Fractions to Lowest Terms
Blueprint Reading: Plan Views

R.S.A. 11- Brazing Copper Pipe
Mathematics: Changing Improper Fractions to Mixed Numbers
Blueprint Reading: Plan Views

R.S.A. 12- Soldering and Brazing Copper Pipe and Tubing
Mathematics: Changing Mixed Numbers to Improper Fractions
Blueprint Reading: Plan Views

R.S.A. 13- Soldering, Tools, and Procedures
Mathematics: Changing Fractions to Higher Terms
Blueprint Reading: Plan Views

R.S.A. 14- Welding
Mathematics: Least Common Denominators
Blueprint Reading: Plan Terms

R.S.A. 15- Mitered Bends
Mathematics: Addition of Fractions
Blueprint Reading: Symbols and Conventions for Plan Views

R.S.A. 16- Branch Layout
Mathematics: Subtraction of Fractions
Blueprint Reading: Symbols and Conventions for Plan Views

R.S.A. 17- Pipe Bend Developing
Mathematics: Multiplication of Fractions
Blueprint Reading: Symbols and Conventions for Plan Views

R.S.A. 18- Pipe Bending
Mathematics: Review Problems
Blueprint Reading: Scaling and Dimensions

R.S.A. 19- Hot Bending
Mathematics: Review Problems
Blueprint Reading: Scaling and Dimensions

R.S.A. 20- Rigging
Mathematics: The Decimal System
Blueprint Reading: Scaling and Dimensions

R.S.A. 21- Valves and Cocks
Mathematics: Addition and Subtraction of Decimals
Blueprint Reading: Scaling and Dimensions

Outline (Continued)

Unit I (Continued)
- R.S.A. 22- Gaskets and Gasket Materials
  - Mathematics: Multiplication of Decimals
  - Blueprint Reading: Structural Details
- R.S.A. 23- Identification of Bolts and Screws
  - Mathematics: Changing Common Fractions to Decimals
  - Blueprint Reading: Structural Details
- R.S.A. 24- Pipe Supports and Hangers
  - Mathematics: Changing Common Fractions to Decimals
  - Blueprint Reading: Structural Details
- R.S.A. 25- Insulating Materials
  - Mathematics: Simple Percentage
  - Blueprint Reading: Structural Details
- R.S.A. 26- Graphical Symbols for Piping
  - Mathematics: Discount
  - Blueprint Reading: Structural Details
- R.S.A. 27- Functions and Operating Principles of Oxy-Acetylene, Regulators, Blowpipes, and Accessories
  - Mathematics: Profit and Loss
  - Blueprint Reading: Structural Details
- R.S.A. 28- Oxy-acetylene Welding
  - Mathematics: Powers and Roots
  - Blueprint Reading: Structural Details
- R.S.A. 29- Arc Welding
  - Mathematics: Measurement of Angles
  - Blueprint Reading: Second Floors for One-and-a-half-story Houses
- R.S.A. 30- Everyday Safety
  - Mathematics: Review
  - Blueprint Reading

Unit II - Sewage Disposal
- R.S.A. 1 - Municipal Sewage Treatment
  - Mathematics: Review of Rectangular Areas
  - Blueprint Reading
- Sketching Problem #1: Sketching Graphic Symbols
- R.S.A. 2 - Municipal Sewer Systems
  - Mathematics: Review of Triangular Areas and Formulas
  - Blueprint Reading
- Sketching Problem #2: Sketching Graphical Symbols (Contd.)
- R.S.A. 3 - Private Sewage Treatment
  - Mathematics: Review of Circles
  - Blueprint Reading
- Sketching Problem #3: Sketching Graphic Symbols

Outline (Continued)

Unit III - Pipes and Fittings

R.S.A. No. 1: Principal Types of Pipes and Fittings
Mathematics: Piping Measurements; Pipe Layouts; Tables
Blueprint Reading

Sketching Problem #1: Sketching Graphic Symbols

R.S.A. No. 2: Joining Vitrified
Mathematics: Square Root
Blueprint Reading

Sketching Problem #2: Sketching Symbols for a Screw-Joint Installation

R.S.A. No. 3: Joining Cast Iron Pipe
Mathematics: Volume
Blueprint Reading

Sketching Problem #3: Sketching Symbols for a Flanged Installation

Unit IV - The House Drainage System

R.S.A. No. 1: The House Sewer
Mathematics: Cylinders
Blueprint Reading

Sketching Problem #1: Hot and Cold Water Piping--Screw Joints

R.S.A. No. 2: The House Drain
Mathematics: Volumes of Cylinders
Blueprint Reading

Sketching Problem #2: Sketching Symbols for a Bell and Spigot Installation

R.S.A. No. 3: House Drain Appliances
Mathematics: Volumes of Cylinders
Blueprint Reading

Sketching Problem #3: Sketching Symbols for a Welded-Joint Installation

Outline (Continued)

Unit IV (Continued)

R.S.A. No. 4: House Drain Appliances (Continued)
Mathematics: Frustrums of Pyramids and Cones
Blueprint Reading

Sketching Problem #4: Sketching Symbols for a Solder-Joint Installation

R.S.A. No. 5: Storm Drainage
Mathematics: Fractions and Decimals
Blueprint Reading

Sketching Problem #5: Sketching Symbols for a Bell and Spigot and Screw-Joint

R.S.A. No. 7: The Waste Pipe
Mathematics: Solution of Formulas
Blueprint Reading

Sketching Problem #7: Sketching Symbols for a Soldered-Joint Installation

Unit V - Traps and Ventilation

R.S.A. No. 1: Traps Used on Plumbing Systems
Mathematics: 45 Degree Elbow Offsets
Blueprint Reading

Sketching Problem #1: Sketching Symbols for a Solder and Screw-Joint Installation

R.S.A. No. 2: Ventilation
Mathematics: To find the Length of an Offset
Blueprint Reading

Sketching Problem #2: Identifying Symbols of a Bell and Spigot Installation

R.S.A. No. 3: Ventilation (Continued)
Mathematics: Calculation of Rolling Offsets
Blueprint Reading

Sketching Problem #3: Identifying Symbols of a Bell and Spigot Installation

Outline (Continued)

Unit V (Continued)

R.S.A. No. 4: Soil, Waste, and Vent Pipe Principles
Mathematics: Radiator Stub Calculations
Blueprint Reading

Sketching Problem #4: Identifying Symbols of a Flange and Screw-Joint Installation

R.S.A. No. 5: Inspection and Test
Mathematics: Piping Measurements
Blueprint Reading

Sketching Problem #5: Identifying Symbols of a Solder and Screw-Joint Installation

Unit VI - Plumbing Water Supply

R.S.A. No. 1: Properties of Water and Its Sources
Mathematics: Oblique Triangles
Problem No. 1: Blueprint Reading
R.S.A. No. 2: Materials Used for Water Distribution
Mathematics: Oblique Triangles - The Law of Cosines
Problem No. 2: Materials Used for Water Distribution
R.S.A. No. 3: Joints on Water Supply Systems
Mathematics: Oblique Triangles
Problem No. 3: Blueprint Questions and Scale Rule Measurement
R.S.A. No. 4: Transite Pressure Pipe
Mathematics: Oblique Triangles
Problem No. 4: Symbols for Blueprints
R.S.A. No. 5: The House Water Supply
Mathematics: Residence Heat-Loss Calculations
Problem No. 5: Graphical Symbols for Plumbing
R.S.A. No. 6: Cold Water Distribution System
Mathematics: Special Pipe Bends
Problem No. 6: Letters and Figures
R.S.A. No. 7: Pumps and Lifts
Mathematics: Special Pipe Bends
Problem No. 7: Drawing the Plan
R.S.A. No. 8: Cold-Water Distribution Systems in Tall Buildings
Mathematics: Subject Matter-Solving by Formulas
Problem No. 8: Drawing for Plumbers

Outline (Continued)

Unit VII - Lead Work

R.S.A. No. 1: The History and Manufacture of Lead
Mathematics: Heat Transmission - Coefficients of Transmission
Problem No. 1: Three Dimensions on One Drawing
R.S.A. No. 2: Lead Working Tools
Mathematics: Coefficients of Transmissions
Problem No. 2: Isometric Drawing
R.S.A. No. 3: Soldering with Irons
Mathematics: Coefficients of Transmission
Problem No. 3: Oblique Drawing
R.S.A. No. 4: Bending Lead Pipe
Mathematics: Calculation of U Factors
Problem No. 4: Pipes in Three Dimension Drawing
R.S.A. No. 5: Care and Cleaning of Wiping Solder--Flange Joints
Mathematics: Calculation of U Factors
Problem No. 5: Pipe Fittings
R.S.A. No. 6: Preparing and Wiping Horizontal Round Joints
Mathematics: Heat-Loss Calculations
Problem No. 6: Pipe Measurement
R.S.A. No. 7: Preparing and Wiping Vertical Round Joints--Branch Joints
Mathematics: Heat-Loss Calculations
Problem No. 7: Waste and Vent
R.S.A. No. 8: Wiping Branch Joints and Wiping Lead to Brass
Mathematics: Heat-Loss Calculations
Problem No. 8: Hot and Cold Water
R.S.A. No. 9: Capping Lead Pipe--Making Sheet Lead Pans and Linings
Mathematics: Graphic Representation--Pressure and Head Curves
R.S.A. No. 10: Lead Welding
Mathematics: Trigonometric Ratios--Capacity of Tanks
Problem No. 10: Layout of Unit Dwellings

Unit VIII - Hot-Water Systems

R.S.A. No. 1: Domestic Hot-Water Supply
Mathematics 1: Review; Linear Measurements and Rule Graduations
R.S.A. No. 2: Hot-Water Distribution Systems
Mathematics 2: Addition, Subtraction, Multiplication, and Division of Whole Numbers

## Outline (Continued)

### Unit IX - Special Piping

R.S.A. No. 1: Domestic Hot-Water Supply
Mathematics 1: Working With Fractions
R.S.A. No. 2: Cross-Connection
Mathematics 2: Working with Decimals
R.S.A. No. 3: Fire Line Installation
Mathematics 3: Simple Percentage, Discount, and Profit and Loss

### Unit X - Plumbing Fixtures

R.S.A. No. 1: Water Closets
Mathematics 1: Powers and Roots
R.S.A. No. 2: The Lavatory
Mathematics 2: Review of Areas
R.S.A. No. 3: The Bathtub
Mathematics 3: Review of Areas of Triangles and Circles
R.S.A. No. 4: Sinks
Mathematics 4: Piping Offset Calculations
R.S.A. No. 5: Special Plumbing Fixtures
Mathematics 5: Volumes

### Unit XI - Radiant Heating

R.S.A. No. 1: Radiant Heating
Mathematics 1: Frustums of Pyramids and Cones
R.S.A. No. 2: Radiant Heating (Continued)
Mathematics 2: Calculation Rolling Offsets
R.S.A. No. 3: Radiant Heating (Continued)
Mathematics 3: Heat-Loss Calculations
R.S.A. No. 4: Radiant Heating (Continued)
Mathematics 4: Final Test
R.S.A. No. 5: Radiant Heating (Concluded)
Mathematics 5: Final Test

### Unit XII - Household Appliances

R.S.A. No. 1: The Food-Waste Disposal Unit and the Automatic Dishwasher
R.S.A. No. 2: The Automatic Washing Machine

### Unit XIII - Domestic Heating

R.S.A. No. 1: Gas Piping

Outline (Continued)

Unit XIII (Continued)

R.S.A. No. 2: Venting Gas Appliances -- Clearance
R.S.A. No. 3: Space Heaters
R.S.A. No. 4: Gas Floor Furnace Installation

Unit XIV - Fire Protection

R.S.A. No. 1: Development of Sprinkler Protection
R.S.A. No. 2: Automatic Sprinkler Installations
R.S.A. No. 3: Special Types of Sprinkler Systems
R.S.A. No. 4: Water-Flow Sprinkler Alarms--Sprinkler Inspection and Supervision

Unit XV - Planning and Estimating

R.S.A. No. 1: Raised Cottage Construction
R.S.A. No. 2: Concrete Slab on Ground Construction
R.S.A. No. 3: Low Priced Raised Cottage Construction
R.S.A. No. 4: Concrete Slab on Ground Construction

Unit XVI - Personal and Social Problems

R.S.A. No. 1: Workmen's Compensation Law in Louisiana
R.S.A. No. 2: Social Security Act

THE PLUMBING AND PIPE FITTING INDUSTRY
(STEAM FITTING)
Apprentice

The Plumbing and Pipe Fitting Industry (Steam Fitting) was published in 1953. It is available in the following forms:

Related Study Assignment
- Book 1
  - Unit I
- Book 2
  - Unit I (Continued)
- Book 3
  - Units II and III
- Book 4
  - Units IV and V

Test Books
- Book 1
  - Unit I
- Book 2
  - Unit II and III
- Book 3
  - Unit IV and V

Answer Books
- Book 1
  - Unit I
- Book 2
  - Units II and III
- Book 3
  - Units IV and V

The following instructor's aids are available:
- Progress Chart

The references for the Plumbing and Pipe Fitting Industry (Steam Fitting) Course are the following:

| Title | Source |
|---|---|
| Dalzell,<br>BUILDING TRADES BLUEPRINT READING, 1950 | American Technical Society<br>848 East Fifty-Eighth Street<br>Chicago 37, Illinois |
| INSTRUCTION MANUAL FOR STEAMFITTING APPRENTICES, Volume I | Heating, Piping and Air Conditioning Contractors National Association<br>1250 Avenue of the Americas<br>New York 20, New York |

A detailed outline of the Plumbing and Pipe Fitting Industry (Steam Fitting) Course follows:

Course Outline

UNIT I - General Course

R.S.A. No. A: Part I: Background of the Plumbing Industry
R.S.A. No. B: Part 2: Development of Steam
R.S.A. No. C: Part 3: History of Refrigeration and Air Conditioning

R.S.A. No. 1: Introduction to Plumbing and Pipe Fitting Industry
Mathematics: Linear Measurement
Blueprint Reading: Shapes of Surfaces and Solids

R.S.A. No. 2: Measuring and Layout Tools
Mathematics: Rule Practice
Blueprint Reading: Elevation Views

R.S.A. No. 3: Wood Boring Tools
Mathematics: Rule Practice
Blueprint Reading: Elevations

R.S.A. No. 4: Wrenches and Utility Tools
Mathematics: Addition of Rule Graduations
Blueprint Reading: Elevations

R.S.A. No. 5: Metal Cutting Tools
Mathematics: Subtraction of Scale Measurements
Blueprint Reading: Elevations

R.S.A. No. 6: Driving Tools
Mathematics: Addition of Whole Numbers
Blueprint Reading: Plan Views

R.S.A. No. 7: Drilling Holes in Metal
Mathematics: Subtraction of Whole Numbers
Blueprint Reading: Symbols for Elevations

R.S.A. No. 8: Punching Holes in Metal
Mathematics: Multiplication of Whole Numbers
Blueprint Reading: Symbols for Elevations

R.S.A. No. 9: Cutting, Reaming, and Threading Tools
Mathematics: Division of Whole Numbers
Blueprint Reading: Symbols of Elevations

R.S.A. No. 10: Tubing Tools
Mathematics: Reducing Fractions to Lowest Terms
Blueprint Reading: Plan Views

Course Outline (Continued)

UNIT I (Continued)

R.S.A. No. 11: Brazing Copper Pipe
Mathematics: Changing Improper Fractions to Mixed Numbers
Blueprint Reading: Plan Views

R.S.A. No. 12: Soldering and Brazing Copper Pipe and Tubing
Mathematics: Changing Mixed Numbers to Improper Fractions
Blueprint Reading: Plan Views

R.S.A. No. 13: Soldering, Tools, and Procedures
Mathematics: Changing Fractions to Higher Terms
Blueprint Reading: Plan Views

R.S.A. No. 14: Welding
Mathematics: Least Common Denominators
Blueprint Reading: Plan Terms

R.S.A. No. 15: Mitered Bends
Mathematics: Addition of Fractions
Blueprint Readings: Symbols and Conventions for Plan View

R.S.A. No. 16: Branch Layout
Mathematics: Subtraction of Fractions
Blueprint Reading: Symbols and Conventions for Plan View

R.S.A. No. 17: Pipe Bend Developing
Mathematics: Multiplication of Fractions
Blueprint Reading: Symbols and Conventions for Plan Views

R.S.A. No. 18: Pipe Bending
Mathematics: Division of Fractions
Blueprint Reading: Scaling and Dimensions

R.S.A. No. 19: Hot Bending
Mathematics: Review Problems
Blueprint Reading: Scaling and Dimensions

R.S.A. No. 20: Rigging
Mathematics: The Decimal System
Blueprint Reading: Scaling and Dimensions

Course Outline (Continued)

UNIT I (Continued)

R.S.A. No. 21: Valves and Cocks
Mathematics: Addition and Subtraction of Decimal
Blueprint Reading: Scaling and Dimensions

R.S.A. No. 22: Gaskets and Gasket Materials
Mathematics: Multiplication of Decimals
Blueprint Reading: Structural Details

R.S.A. No. 23: Identification of Bolts and Screws
Mathematics: Changing Common Fractions to Decimals
Blueprint Reading: Structural Details

R.S.A. No. 24: Pipe Supports and Hangers
Mathematics: Changing Common Fractions to Decimals
Blueprint Reading: Structural Details

R.S.A. No. 25: Insulating Materials
Mathematics: Simple Percentage
Blueprint Reading: Structural Details

R.S.A. No. 26: Graphical Symbols for Piping
Mathematics: Discount
Blueprint Reading: Structural Details

R.S.A. No. 27. Functions and Operating Principles of Oxy-Acetylene, Regulators, Blowpipes, and Accessories
Mathematics: Profit and Loss
Blueprint Reading: Structural Details

R.S.A. No. 28: Oxy-Acetylene Welding
Mathematics: Powers and Roots
Blueprint Reading: Structural Details

R.S.A. No. 29: Arc Welding
Measurement of Angles
Blueprint Reading: Second Floors for One-and-a-half-story houses

R.S.A. No. 30: Everyday Safety
Mathematics: Review
Blueprint Reading:

Course Outline (Continued)

## UNIT II - Related Science

R.S.A. No. 1: Pressure of Liquids at Rest-Heads
Mathematics: Review of Rectangular Areas
Blueprint Reading

R.S.A. No. 2: Atmospheric Pressure
Mathematics: Review of Triangular Area and Formulas
Blueprint Reading

R.S.A. No. 3: Weight, Density, and Specific Gravity
Mathematics: Review of Circles
Blueprint Reading

R.S.A. No. 4: Buoyancy
Mathematics: Piping Measurements, Pipe Layouts; Tables
Blueprint Reading

R.S.A. No. 5: Water Head
Mathematics: Square Root
Blueprint Reading

R.S.A. No. 6: Molecular Basis of Heat
Mathematics: Volume
Blueprint Reading

R.S.A. No. 7: An Elementary Study of Heat
Mathematics: Cylinders
Blueprint Reading

R.S.A. No. 8: Intensity of Heat-Temperature
Mathematics: Volumes
Blueprint Reading

R.S.A. No. 9: Specific Heat
Mathematics: Volumes of Cylinders
Blueprint Reading

R.S.A. No. 10: A Study of B.T.U.
Mathematics: Frustrums of Pyramids and Cones
Blueprint Reading

R.S.A. No. 11: Generation of Heat
Mathematics: Fractions and Decimals
Blueprint Reading

Course Outline (Continued)

UNIT II (Continued)

R.S.A. No. 12: Expansion
Mathematics: Piping Measurements
Blueprint Reading

R.S.A. No. 13: Steam Tables and Latent Heat
Mathematics: Solution of Formulas
Blueprint Reading

R.S.A. No. 14: Work and Power
Mathematics: 45 Degree Elbow Offsets
Blueprint Reading

UNIT III - Related Science

R.S.A. No. 1: Forms of Heat
Mathematics: To Find the Length of an Offset
Blueprint Reading

R.S.A. No. 2: Properties of Water
Mathematics: Calculation of Rolling Offsets
Blueprint Reading

R.S.A. No. 3: Evaporation and Boiling
Mathematics: Radiator Stub Calculations
Blueprint Reading

R.S.A. No. 4: Pressure
Mathematics: Piping Measurements
Blueprint Reading

R.S.A. No. 5: Relations of Temperature, Pressure and Volume of Steam
Mathematics: Arithmetic--Square Root

R.S.A. No. 6: Flow of Steam in Pipes
Mathematics: To Find the Unknown Angles

R.S.A. No. 7: Critical Velocity
Mathematics: Trigonometry Method

R.S.A. No. 8: Miscellaneous Procedures
Mathematics: Trigonometry Method

R.S.A. No. 9: Review Test

R.S.A. No. 10: Review Test

Course Outline (Continued)

## UNIT IV - Related Science

R.S.A. No. 1: Considerations in Installing a One-Pipe Gravity Steam System
Mathematics: Review of Right Triangles

R.S.A. No. 2: Piping Connections to Boiler
Mathematics: Oblique Triangles--The Law of Sines

R.S.A. No. 3: Piping Between Boiler and Radiators
Mathematics: Oblique Triangles

R.S.A. No. 4: Standards for Sizing Boilers
Mathematics: Oblique Triangles--The Law of Cosines

R.S.A. No. 5: Air Elimination
Mathematics: Oblique Triangles

R.S.A. No. 6: Unit Heater Connections
Mathematics: Oblique Triangles

R.S.A. No. 7: Special Piping Arrangements
Mathematics: Review Test

R.S.A. No. 8: Vapor Heating
Mathematics: Review Test

R.S.A. No. 9: Radiator Traps -- Boiler Return Traps
Mathematics: Review Test

R.S.A. No. 10: Air Eliminator
Mathematics: Special Pipe Bends

R.S.A. No. 11: Automatic Boiler Water Feeder
Mathematics: Special Pipe Bends

R.S.A. No. 12: Vacuum System of Steam Heating--Jennings Vacuum Heating Pump
Mathematics: Heat Transmission

R.S.A. No. 13: Dunham Sub-Atmospheric System
Mathematics: Calculation of U Factors

## V - Related Science

R.S.A. No. 1: Dunham Vacuum Heating Pump
Mathematics: Heat-Loss Calculations

Course Outline (Continued)

UNIT V (Continued)

| | | |
|---|---|---|
| R.S.A. No. | 2: | Differential Controller and Selector<br>Mathematics: Residence Heat Loss Calculations |
| R.S.A. No. | 3: | Control Valve and Panel<br>Mathematics: Heat Loss Calculation for Two Apartment Building |
| R.S.A. No. | 4: | Illinois Selective Pressure System<br>Mathematics: Heating Estimate for Industrial Building |
| R.S.A. No. | 5: | Webster Moderator System<br>Mathematics: Graphic Representation |
| R.S.A. No. | 6: | High Vacuum Pump--Comparison of Controls<br>Mathematics: Pressure-Head Curves of Water |

The Electrical Utility Workers Training Program material was published in 1962-1963. It is available in book form for the Instructors and Handouts are available for students.

Unit I
    Book - Basic Mathematics
Unit II
    Book - Simplified Electricity
Unit III
    Book - Transformers
Unit IV
    Book - Power Distribution and Transmission

The references for the Electrical Utility Workers Training Program are the following:

| Title | Source |
|---|---|
| Cooke, Nelson M.<br>BASIC MATHEMATICS FOR ELECTRONICS<br>Second Edition | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Van Valkenburgh, Nooger and Neville, Inc.<br>BASIC ELECTRICITY | John F. Rider Publisher, Inc.<br>116 West 14th Street<br>New York 11, New York |
| TRANSFORMER TRAINING PROGRAM<br>Instructor's Manual | Westinghouse Electric Corp.<br>3875 Florida Avenue<br>Baton Rouge, Louisiana |
| TRANSFORMER STUDY MANUALS<br>SA-6789-6B, 1955 | Westinghouse Electric Corp.<br>3875 Florida Avenue<br>Baton Rouge, Louisiana |
| "ON LINE," Part of Unit III, Electrical Utility Workers Training Program | Louisiana State Voc.-Tech.<br>Curriculum Laboratory<br>P. O. Box 657<br>Natchitoches, Louisiana |
| DISTRIBUTION TRANSFORMER MANUAL<br>2485A | General Electric Company<br>Post Office Box 15338<br>Baton Rouge 15, Louisiana |
| Croft, Terrell<br>AMERICAN ELECTRICIAN'S HANDBOOK | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |

References (Continued)

| Title | Source |
|---|---|
| Student Handout #1<br>DISTRIBUTION APPARATUS HANDBOOK<br>EXCERPTS AND RELATED INFORMATION<br>Courtesy of Westinghouse<br>Electric Corp. | Louisiana State Voc.-Tech.<br>Curriculum Laboratory<br>P. O. Box 657<br>Natchitoches, Louisiana |
| DISTRIBUTION SYSTEMS<br>Volume III | Westinghouse Electric Corp.<br>3875 Florida Avenue<br>Baton Rouge 15, Louisiana |
| Skrotzki, Bernhardt G. A.<br>ELECTRIC TRANSMISSION AND<br>DISTRIBUTION, 1954 | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street,<br>New York 36, New York |
| ELECTRICAL UTILITY WORKERS<br>TRAINING PROGRAM, Unit III,<br>Transformers | Louisiana State Voc.-Tech.<br>Curriculum Laboratory<br>P. O. Box 657<br>Natchitoches, Louisiana |
| INDUSTRIAL POWER SYSTEM<br>DATA BOOK | General Electric Company<br>Post Office Box 15338<br>Baton Rouge 15, Louisiana |
| NATIONAL ELECTRICAL CODE | The National Board of<br>Fire Underwriters<br>85 John Street<br>New York 38, New York |
| NATIONAL ELECTRICAL SAFETY CODE<br>HANDBOOK, latest edition | American Standards Association<br>70 East 45th Street<br>New York, New York |
| SPECIFICATIONS AND DRAWINGS FOR<br>7.2/12.5 KV. LINE CONSTRUCTION<br>1962 | Rural Electrification<br>Administration<br>Washington, D. C. |
| SPECIFICATIONS MANUAL,<br>ELECTRIC EQUIPMENT<br>AIA File #31.R, 1959 | General Electric Company<br>Post Office Box 15338<br>Baton Rouge 15, Louisiana |
| Knowlton, A. E.<br>STANDARD HANDBOOK FOR<br>ELECTRICAL ENGINEERS<br>9th edition | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |

References (Continued)

| Title | Source |
|---|---|
| Kurtz, E. B.<br>THE LINEMAN'S HANDBOOK<br>3rd edition | McGraw-Hill Book Co., Inc.<br>330 West 42nd Street<br>New York 36, New York |

A detailed outline of the Electrical Utility Workers Training Program follows:

Unit I - BASIC MATHEMATICS

Lesson Plan 1 - Review of Addition and Subtraction
Lesson Plan 2 - Review of Multiplication and Division
Lesson Plan 3 - Common Fractions - Addition and Subtraction
Lesson Plan 4 - Common Fractions - Multiplication and Division
Lesson Plan 5 - Mixed Numbers
Lesson Plan 6 - Decimal Fractions and Conversions
Lesson Plan 7 - Percentage, Ratio and Proportion
Lesson Plan 8 - Square Root
Lesson Plan 9 - Introduction to Algebra
Lesson Plan 10 - General Numbers
Lesson Plan 11 - Solving Problems by Equations
Lesson Plan 12 - Literal Equations with One Unknown

Unit II - SIMPLIFIED ELECTRICITY

Lesson Plan 1 - Magnetism
Lesson Plan 2 - Methods of Producing Electricity
Lesson Plan 3 - Current Electricity
Lesson Plan 4 - Measuring Voltage, Current and Resistance
Lesson Plan 5 - Ohm's Law--Series Circuits
Lesson Plan 6 - Electric Power
Lesson Plan 7 - Ohm's Law--Parallel Circuits
Lesson Plan 8 - Alternating Current
Lesson Plan 9 - Inductance and Inductive Reactance
Lesson Plan 10 - Capacitance and Capacitive Reactance
Lesson Plan 11 - Impedance in A.C. Series Circuits

Unit III - TRANSFORMERS

Lesson Plan 1 - Basic Theories and Principles
Lesson Plan 2 - Transformer Parts, Construction and Assembly
Lesson Plan 3 - Transformer Protection
Lesson Plan 4 - Transformer Connections (Part I)
Lesson Plan 5 - Transformer Connections (Part II)
Lesson Plan 6 - Transformer Maintenance

Course Outline (Continued)

Unit IV - POWER DISTRIBUTION AND TRANSMISSION

Lesson Plan 1 - Distribution Systems
Lesson Plan 2 - A Study of Primary Distribution Systems
Lesson Plan 3 - Power Factor
Lesson Plan 4 - Power Factor (Continued)
Lesson Plan 5 - Distribution Transformers
Lesson Plan 6 - The Secondary Distribution System and Primary System Protection
Lesson Plan 7 - Methods of Increasing the Capacity, Improving Voltage Regulation and Grounding the Distribution System
Lesson Plan 8 - Electrical Measuring Instruments
Lesson Plan 9 - Electrical Measurement Instruments (Continued)
Lesson Plan 10 - Street Lighting
Lesson Plan 11 - Distribution Line Construction

Slides to be used with this course are also available. There are 277 slides in a set at $1.00 per slide.

The Highway Engineering Aide Training Program material was published in 1958-1959. It is available in the following forms:

Unit I
    Book - Arithmetic (Lessons)
Unit II
    Book - Algebra (Lessons)
Unit III
    Book - Geometry and Trigonometry
Unit IV
    Book - Drawing
Unit V
    Book - Surveying

The following instructor's aids are available:
- Book 1 - Instructor's Lesson Plans (Arithmetic)
  - Tests
  - Answers
- Book 2 - Instructor's Lesson Plans (Algebra)
  - Tests
  - Answers
- Book 3 - Instructor's Lesson Plans (Geometry and Trigonometry)
  - Tests
  - Answers
- Book 5 - Instructor's Lesson Plans (Surveying)
  - Tests
  - Answers

The references for the Highway Engineering Aide Training Program are the following:

| Title | Source |
|---|---|
| Slade, Samuel and Margolis, Lois,<br>MATHEMATICS FOR TECHNICAL AND VOCATIONAL SCHOOLS | John Wiley and Sons, Inc.<br>440 Fourth Avenue<br>New York 16, New York |
| Giesecke, Mitchell, and Spencer,<br>TECHNICAL DRAWING | The MacMillan Co.<br>Ross Avenue and Akard St.<br>Dallas 1, Texas |
| Castel, Drew W.,<br>PROBLEMS IN BLUEPRINT READING | Chas. A. Bennett Co., Inc.<br>237 N. Monroe Street<br>Peoria, Illinois |

References (Continued)

| Title | Source |
|---|---|
| APPLIED MATHEMATICS FOR PETROLEUM INDUSTRY | Petroleum Extension Service<br>University of Texas<br>Austin, Texas |
| Virgil S. Mallory, FIRST ALGEBRA | I. W. Singer Company, Inc.<br>249-259 West Erie Blvd.<br>Syracuse 12, New York |
| Davis and Kelly, SHORT COURSE IN SURVEYING | McGraw Hill Book Co.<br>330 West 42nd Street<br>New York 36, New York |

A detailed outline of the Highway Engineering Aide Training Program material follows:

Unit I - Arithmetic

Lesson #1
- I. Introduction
- II. Whole Numbers
  - A. Reading and Writing Numbers
  - B. Addition and Checking Addition
  - C. Subtraction
  - D. Multiplication

Lesson #2
- II. Whole Numbers (Continued)
  - E. Division
- III. Common Fractions
  - A. Addition
  - B. Substraction

Lesson #3
- III. Common Fractions (Continued)
  - C. Multiplication
  - D. Division
- IV. Mixed Numbers
  - A. Addition

Lesson #4
- IV. Mixed Numbers (Continued)
  - B. Subtraction
  - C. Multiplication
  - D. Division

Lesson #5
- V. Decimal Fractions
  - A. Reading and Writing Decimals
  - B. Addition of Decimals
  - C. Subtraction of Decimals

Course Outline (Continued)

Unit I - Arithmetic (Continued)

Lesson #6
- V. Decimal Fractions (Continued)
    - D. Multiplication
    - E. Division

Lesson #7
- VI. Conversions
    - A. Common Fractions to Decimal Fractions
    - B. Decimal Fractions to Common Fractions
    - C. Review

Lesson #8
- VII. Examination

Lesson #9
- VIII. Percentage
    - A. Definitions
    - B. Equivalents
- IX. Ratio and Proportion
    - A. Ratio
    - B. Proportion
    - C. Inverse Proportion

Lesson #10
- X. Square Root
    - A. Examination Critique
    - B. Definition
    - C. Extracting the Square Root

Lesson #11
- XI. Measurements
    - A. Feet and Inches
    - B. Time
    - C. Weight
    - D. Temperatures

Lesson #12
- XI. Measurements (Continued)
    - E. Density and Specific Gravity

Lesson #13
- XI. Measurements (Continued)
    - F. Absorption and Surface Moisture
    - G. Board Measure
    - H. Review

Lesson #14
- XI. Measurements (Continued)
    - I. Land Measure

Lesson #15
- XII. Plane Figures
    - A. Areas and Perimeters of Rectangles
    - B. Areas and Perimeters of Parallelograms
    - C. Areas and Perimeters of Trapezoids
    - D. Areas and Perimeters of Triangles
    - E. Areas and Perimeters of Circles
    - F. Areas and Perimeters of Elipses

Course Outline (Continued)

Unit I - Arithmetic (Continued)

Lesson #16
XIII. Solid Figures
  A. Volumes of Rectangular Shaped Solids
  B. Volumes of Cylinders
  C. Volumes of Cones
  D. Volumes of Frustrums of Pyramids and Cones
  E. Volumes of Spheres

Lesson #17
XIV. Examination
Pass out the examination. Be sure that the students return all question sheets

Unit II - Algebra

Lesson #1
I. Introduction
  A. Comparison
  B. Definition
  C. Signs or Symbols of Operation
  D. General Application of Signs and Symbols

Lesson #2
II. General Numbers
  A. Addition and Subtraction of Literal Numbers
  B. Multiplication and Division of Literal Numbers
  C. Exponents and Powers in Formulas
  D. Developing Formulas

Lesson #3
III. Solving Problems by Equations
  A. Axiom I - Division
  B. Axiom II - Multiplication
  C. Axiom III - Subtraction
  D. Axiom IV - Addition
  E. Consecutive Integers
  F. Changing the Subject of a Formula

Lesson #4
IV. Signed Numbers
  A. Definition
  B. Number Scales
  C. Use in Graphs
  D. Addition of Signed Numbers
  E. Subtracting Signed Numbers
  F. Multiplication of Signed Numbers
  G. Signs of Powers
  H. Division of Signed Numbers
  I. Division Written as a Fraction
  J. Algebraic Terms

Course Outline (Continued)

Lesson #4 (Continued)
- K. Addition of Polynomials
- L. Subtraction of Polynomials
- M. Multiplication of a Polynomial by a Signed Number
- N. Use of Parentheses
- O. Translation of statements into symbols

Lesson #5
- V. Graphs
  - A. Bar Graphs
  - B. Circle Graphs
  - C. Line Graphs
  - D. Line Graph of Formulas
  - E. Line Graphs to Solve Problems
  - F. Location of Points on a Graph
  - G. Graphs of Equations with two Unknowns
  - H. Solving a pair of Linear Equations by Graphs
  - I. Formula for a Linear Equation

Lesson #6
- VI. Equations with two Unknowns
  - A. Solving by Addition
  - B. Solving by Substitution
  - C. Problems involving two Unknowns

Lesson #7
- VII. Product and Quotient of Literal Numbers
  - A. Product of Two Monomials
  - B. Product of more than Two Monomials
  - C. Product of a Polynomial by a Monomial
  - D. Product of Two Binomials
  - E. Quotient of Two Monomials
  - F. Quotient of a Polynomial by a Monomial

Lesson #8
- VIII. Special Products and Factors
  - A. How to find Monomial Factors
  - B. Factoring of a Trinomial
  - C. Square of a Binomial
  - D. Product of the Sum and Difference of Two Quantities
  - E. Factoring the Difference of Two Squares
  - F. Finding all the prime Factors
  - G. Squaring a Binomial like ab + cd
  - H. Factoring a Perfect Square
  - I. Factoring a Quadratic Trinomial
  - J. Shortcuts in Computation

Course Outline (Continued)

Unit II - Algebra (Continued)

Lesson #9
- IX. Using Algebraic Fractions in Formulas and Equations
  - A. Reduction of a Fraction
  - B. Changing an Improper Fraction to an Integer or Mixed Expression
  - C. Multiplication of Fractions
  - D. Division of Fractions
  - E. Addition of Fractions with Monomial Denominators
  - F. Addition of Fractions with Binomial Denominators
  - G. Signs of a Fraction
  - H. Changing a Mixed Expression to a Fraction
  - I. Complex Fractions in Algebra

Lesson #10
- X. Ratio and Proportion
  - A. Using Ratios
  - B. Constants, Variables, and Functions
  - C. Similar Figures and Proportion

Lesson #11
- XI. Square Root and Radicals
  - A. Definitions
  - B. Approximate
  - C. Exact Computation
  - D. The Square Root of a Product
  - E. Multiplication of Radicals
  - F. Addition and Subtraction of Radicals
  - G. Value of Mixed Expressions
  - H. Finding the Square Root of a Fraction
  - I. Rationalization of the Denominator of a Fraction
  - J. Use of Fractional Exponents
  - K. Division of a Radical

Lesson #12
- XII. Quadratic Equations
  - A. Definition
  - B. Perfect Square Trinomials
  - C. Solving by Completion of the Square
  - D. Quadratic Equations with Irrational Roots
  - E. A Formula for Solving Quadratic Equations
  - F. Graphs of Quadratic Equations

Lesson #13
- XIII. Quadratic Systems
  - A. Equation of a Circle
  - B. The Equation of a Parabola
  - C. The Equation of an Ellipse
  - D. One equation of a Hyperbola
  - E. Second Equation of a Hyperbola
  - F. Graphical Solution of a Linear Equation and a Quadratic Equation
  - G. Algebraic Solution of a Linear and Quadratic Equation
  - H. Graphical Solution of Two Quadratic Equations

Course Outline (Continued)

Unit II - Algebra (Continued)

Lesson #14
XIV. Logarithms
- A. Meaning of Logarithms
- B. Logarithms to the Base 10
- C. Determination of Complete Logarithms
- D. Finding N When Log N is Given
- E. Finding the Logarithms of numbers not given in the Tables
- F. Multiplying with Logarithms
- G. Dividing with Logarithms
- H. Finding Powers with Logarithms
- I. Finding Roots With Logarithms

Lesson #15
XV. Progressions and the Binomial Theorem
- A. Sequences
- B. Arithmetic Progressions
- C. Last Term of An Arithmetic Progression
- D. Finding Arithmetic Means
- E. Sum of An Arithmetic Progression
- F. Geometric Progressions
- G. The Last Term of a Geometric Progression
- H. Finding Geometric Means
- I. Sum of a Geometric Progression
- J. Expanding a Binomial
- K. Factorial Notation
- L. Finding a Particular Term of $(a + b)^n$
- M. Expansions with Negative and Fractional Exponents
- N. Finding a Root by the Binomial Theorem

Unit III - Geometry and Trigonometry

Lesson #1
I. Introduction of Mensuration
II. Squares and Rectangles
- A. Angles, right angles, squares and units of area
- B. Area of rectangles and related problems
- C. Square roots of various types of numbers

Lesson #2
III. Triangles
- A. Definitions of right triangle, base, altitude and hypotenuse
- B. Pythagorean Theorem
- C. Area of a right triangle
- D. Definition of isosceles triangle, base angle, base and vertex

Course Outline (Continued)

Unit III - Geometry and Trigonometry (Continued)

Lesson #2 (Continued)
- E. Area of an Isosceles Triangle
- F. Definition of an Equilateral Triangle
- G. Area of an Equilateral Triangle
- H. Define Scalene or Oblique Triangle and Find the Areas
- I. Angle Measurement and Sum of Angles in a Triangle

Lesson #3
- IV. Use of constants, area of quadrilaterals and scale Drawing
  - A. Hexagon, Octagon and the Use of Constants
  - B. Quadrilaterals
  - C. Use of Scale Drawings

Lesson #4
- V. The Circle and Ellipse
  - A. Radius, Diameter, Circumference and Area of a Circle
  - B. Arc, Sectors and Central Angles
  - C. Area of a Sector and Length of an Arc
  - D. Circumscribed and Inscribed Figures and Relationships
  - E. Segment of a Circle and its Area
  - F. Area of an Ellipse
  - G. Practical Application Problems and Formulas

Lesson #5
- VI. Solid Figures and Volumes
  - A. Volume and Surface Areas of Prisms, Cylinders, and Cones
  - B. Volumes and Surface Areas of a Frustum of a Cone or Pyramid
  - C. Volume and Surface Area of a Sphere
  - D. Volumes of Composite Figures

Lesson #6
- VII. Basic Geometric Construction Including Lines
  - A. Construction of Bisectors of Lines, Angles, and Arcs
  - B. Construction of Perpendiculars of Various Types to a Given Line
  - C. Construction of Parallel Lines to a Given Line
  - D. Division of a Line Into Any Number of Equal Parts
  - E. Construction of an Equilateral Triangle and Angles of any Size

Lesson #7
- VIII. Construction Involving Circles
  - A. Determination of Center of Circle or Circular Area

Course Outline (Continued)

Unit III - Geometry and Trigonometry (Continued)

Lesson #7 (Continued)
- B. Inscription of Various Types of Plane Figures in a Circle
- C. Construction of Circles Equal in Area to the Sum or Difference of the areas of two given circles
- D. Construction of Tangents of Various Types to a Given Circle or Circles

Lesson #8
- IX. Miscellaneous Constructions
  - A. Construction of a Square Equal in Area to the Sum or Difference of the Areas of Two Given Squares
  - B. Construction of a Square of a Given Area
  - C. Construction of a Hexagon With Sides of a Given Length and With One Side on a Given Line
  - D. Construction of an Octagon, an Ellipse, and a Pentagon

Lesson #9
- X. Introduction to Trigonometry

Lesson #10
- XI. The Oblique Triangle
  - A. Use of the Law of Sines in Solving an Oblique Triangle (2 Cases)
  - B. Use of the Law of Cosines to Solve an Oblique Triangle (2 Cases)
  - C. Use of Formulas Involving Trigonometric Functions to Find the Area of Triangle
  - D. Summary of Methods of Solving a Triangle of any Type.

Unit IV - Drawing

| | |
|---|---|
| Lesson #1 | Beginning Drawing |
| Lesson #2 | Geometrical Construction |
| Lesson #3 | Lettering |
| Lesson #4 | Methods of Drawing |
| Lesson #5 | Three View Drawing |
| Lesson #6 | Three View Problems |
| Lesson #7 | Sections |
| Lesson #8 | Dimensions and Notes |
| Lesson #9 | Drawing Exercises |
| Lesson #10 | Drawing Exercises and Auxiliary Views |
| Lesson #11 | Projection Study |
| Lesson #12 | Topographical Drawing |
| Lesson #13 | Reproduction of Drawings |

Course Outline (Continued)

Unit V - Surveying

Lesson #1
- I. Field and Office Work
  - A. Description
    - (a) Field work
    - (b) Office work
    - (c) Errors
      - 1. Sources of errors
      - 2. Kind of error
      - 3. Theory of Probability
      - 4. Probable Value
      - 5. Probable Error

Lesson #2
- II. Measurement of Distances
  - A. Methods
  - B. Equipment for Chaining
  - C. Chaining on Level Ground
  - D. Horizontal Measurements over Uneven or Sloping Ground
  - E. Measurements on Slopes
    - (a) Corrections for Slopes
    - (b) Errors in Chaining; Corrections for Changes in Temperature
    - (c) Mistakes in Chaining

Lesson #3
- III. Measurements of Difference in Elevation
  - A. Curvature of the Earth; Refraction
  - B. Methods
    - (a) Direct or Differential Leveling
    - (b) Indirect or Trigonometric Leveling
    - (c) Profile Leveling
  - C. Direct Leveling
    - (a) General Applications
    - (b) Instruments
    - (c) Leveling Rods
    - (d) Reading the Rod

Lesson #4
- IV. Differential and Profile Leveling
  - A. Definitions
  - B. Procedure
  - C. Common Mistakes in Leveling
  - D. Errors in Ordinary Leveling
    - (a) Imperfect Adjustment of Instruments
    - (b) Earth's Curvature and Atmospheric Refraction
    - (c) Rod not Standard Length
    - (d) Rod not Held Plumb
    - (e) Faulty Turning Points
    - (f) Bubble not Exactly Centered at Time of Reading

Course Outline (Continued)

Unit V - Surveying (Continued)

Lesson #4 (Continued)
- E. Profile Leveling
- F. Vertical Curves
  - (a) Plotting Profiles
  - (b) Fixing Grades
  - (c) Borrow Pit Cross-sections
  - (d) Cut and Fill Stakes
  - (e) Cross Sections of Roadway
  - (f) Plotting and Computing Earthwork

Lesson #5
- V. Measurements of Angles and Direction
  - A. General Discussion
  - B. Magnetic Meridian
  - C. Magnetic Declination
  - D. Angles and Direction
  - E. Bearings
  - F. Azimuths
  - G. Deflection Angles
  - H. Traverses
  - I. Triangulation
  - J. Surveyor's Compass

Lesson #6
- VI. The Engineer's Transit
  - A. General Description
    - (a) Telescope
    - (b) Verniers
    - (c) Graduated Circles
  - B. Use of Transit
    - (a) Setting up the Transit
    - (b) Measuring a Horizontal Angle
    - (c) Common Mistakes
    - (d) Measuring an Angle by Repetition
    - (e) Measuring a Vertical Angle
    - (f) Prolonging a Straight Line

Lesson #7
- VII. Transit Tape Surveys
  - A. General Description
  - B. Transit Surveys
  - C. Radiation
  - D. Intersection
  - E. Traversing
    - (a) Deflection-angle Traverse
    - (b) Azimuth Traverse
    - (c) Traverse Computations
    - (d) Checking Traverses
    - (e) Referencing Transit Stations

Course Outline (Continued)

Unit V - Surveying (Continued)

Lesson #8
- VIII. Stadia Surveying
  - A. Principle of the Stadia
  - B. Inclined Sights

Lesson #9
- IX. Map Drafting
  - A. Drawings of Surveying
    - a. Vicinity Map
    - b. Typical Sections
    - c. Standards

Lesson #10
- X. Calculation of Areas of Land
  - A. Methods of Determining Area
  - B. Determining Plane Areas by Use of Coordinates

Lesson #11
- XI. Topographic Surveying
  - A. General Field Methods (Definition)
  - B. Control
    - (a) Horizontal Control
    - (b) Vertical Control
  - C. Site and Construction Surveys
    - (a) Alignment and Grade
  - D. State Systems of Plane Coordinates

Lesson #12
- XII. Route Surveying
  - A. General (Definition)
  - B. Preliminary Survey
    - (a) Transit-tape-level Method
    - (b) Transit-stadia Method
  - C. Preliminary Profile and Map
  - D. Location Survey: (Paper Location)
  - E. Field Location and Office Work

Lesson #13
- XIII. Construction Surveys
  - A. General (Definition)
  - B. Highways
  - C. Bridges

Lesson #14
- XIV. Curves
  - A. Circular Curves
  - B. Curve Formulas
  - C. Laying Out Curve by Deflection Angles
  - D. Transit Set-ups on Curves
  - E. Transition Curves

Course Outline (Continued)

Lesson #15
- XV. Cross-Sections
    - A. Form of Cross-Sections
    - B. Original Cross-Sections
    - C. Final Cross-Section
    - D. Cuts and Fills
    - E. Setting Slope Stakes
    - F. Plotting Cross-Sections
    - G. Computations of Cross-Sections
        - (a) Volumes of Earth Work in General
        - (b) Volumes of Borrow Pits
        - (c) Volumes by Average End Areas

Lesson #16
- XVI. Land Surveying
    - A. Instruments and Methods
    - B. Corners and Monuments
    - C. Meander Lines
    - D. Liability of a Surveyor
    - E. Standard Lines
    - F. Townships
    - G. Sections
    - H. Subdivision of Sections

Instructor's Lesson Plans

Unit I - Arithmetic

Lesson Plan 1 - Whole Numbers
Lesson Plan 2 - Common Fractions
Lesson Plan 3 - Mixed Numbers
Lesson Plan 4 - Decimal Fractions and Conversions
Lesson Plan 5 - Percentage, Ratio and Proportion, and Square Roots
Lesson Plan 6 - Measurements
Lesson Plan 7 - Plane Figures
Lesson Plan 8 - Solid Figures

Class Problem #1 - Whole Numbers and Common Fractions
Class Problem #2 - Percentages, Ratio and Proportion, Square Root and Measurements
Class Problem #3 - Land Measures, Plane Figures, and Solid Figures

Examination #1
Examination #2

Answer Sheet

Course Outline (Continued)

Unit II - Algebra

Lesson Plan 1 - Introduction to Algebra
Lesson Plan 2 - General Numbers
Lesson Plan 3 - Solving Problems by Equations
Lesson Plan 4 - Signed Numbers
Lesson Plan 5 - Graphs
Lesson Plan 6 - Equations with two Unknowns
Lesson Plan 7 - Product and Quotient of Literal Numbers
Lesson Plan 8 - Special Products and Factors
Lesson Plan 9 - Using Algebraic Fractions in Formulas and Equations
Lesson Plan 10 - Ratio and Proportion
Lesson Plan 11 - Square Roots and Radicals
Lesson Plan 12 - Quadratic Equations
Lesson Plan 13 - Quadratic Systems
Lesson Plan 14 - Logarithms
Lesson Plan 15 - Progressions and the Binomial Theorem

Unit III - Geometry and Trigonometry

Lesson Plan 1 - Introduction to Mensuration
Lesson Plan 2 - Triangles
Lesson Plan 3 - Use of Constants, Area of Quadrilaterals, and Scale Drawing
Lesson Plan 4 - The Circle and Ellipse
Lesson Plan 5 - Solid Figures and Volumes
Lesson Plan 6 - Basic Geometric Constructions Involving Lines
Lesson Plan 7 - Constructions Involving Circles
Lesson Plan 8 - Miscellaneous Constructions
Lesson Plan 9 - Introduction of Trigonometry
Lesson Plan 10 - The Oblique Triangle

Test on Unit 3 Lesson Plans 1, 2, and 3
Test on Unit 3 Lesson Plans 4 and 5
Test on Unit 3 Lesson Plans 6, 7, and 8
Test on Unit 3 Lesson Plans 9 and 10

Answer Sheet

Unit V - Surveying

Lesson #1 - Field and Office Work
Lesson #2 - Measurement of Distances
Lesson #3 - Measurements of Difference in Elevation

Course Outline (Continued)

Unit V - Surveying (Surveying)

Lesson #4 - Differential and Profile Leveling
Lesson #5 - Measurements of Angles and Directions
Lesson #6 - The Engineer's Transit
Lesson #7 - Transit Tape Surveys
Lesson #8 - Stadia Surveying
Lesson #9 - Map Drafting
Lesson #10 - Calculation of Areas of Land
Lesson #11 - Topographic Surveying
Lesson #12 - Route Surveying
Lesson #13 - Construction Surveys
Lesson #14 - Curves
Lesson #15 - Cross-Sections
Lesson #16 - Land Surveying

Test on U5LP 1, 2, & 3
Test on U5LP 4
Test on U5LP 5, 6, & 7
Test on U5LP 8, 9, & 10
Test on U5LP 11, 12, 13, 14, 15, & 16

Answers for U5 Lessons Plans

Answers for Tests for Unit 5

BUSINESS LETTER WRITING
FOR INDUSTRIAL SUPERVISORS
Supervisory Personnel
Development

C Page 1 of 3

The Business Letter Writing For Industrial Supervisors Course was written in 1959. It is available in book form. This book consists of 13 Lessons. An Instructor's Guide is also available.

The references for this course are listed below.

| Title | Source |
|---|---|
| Hagar, Stewart, and Hutchinson<br>BUSINESS ENGLISH AND LETTER WRITING | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Robertson and Carmichael,<br>BUSINESS LETTER ENGLISH,<br>2nd Edition | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Gavin and Hutchinson,<br>REFERENCE MANUAL FOR STENOGRAPHERS AND TYPISTS,<br>Second Edition | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |
| Lucy Graves Mayo,<br>COMMUNICATIONS HANDBOOK FOR SECRETARIES | McGraw-Hill Book Company, Inc.<br>330 West 42nd Street<br>New York 36, New York |

A detailed outline of the Business Letter Writing For Industrial Supervisors Course follows:

- Lesson I: Business Letter Writing
  - A. Past
  - B. Present
  - C. Future
- Lesson II: Why We Write Business Letters
  - A. Four Basic "musts" of business correspondence
    - 1. Clearness
    - 2. Completeness
    - 3. Conciseness
    - 4. Courtesy
- Lesson III: Overhead and the Business Letter
  The Words We Use
  - A. Master-Bailiff words and phrases
  - B. Overworked words and phrases
  - C. Unnecessary repetitions
  - D. Negative Words
- Lesson IV: Business Letter Format
  - A. The Parts of a Business Letter
    - 1. The heading
    - 2. The date line
    - 3. The inside address
    - 4. The attention line

Course Outline (Continued)

5. The salutation
6. The subject line
7. The body of the letter
8. The complimentary closing
9. The signature lines
10. Identification initials
11. Enclosure reference

Lesson V: Styles in Business Letters
- A. Style accessories
- B. Eight styles for study
  1. Blocked
  2. Semiblocked
  3. Indented
  4. Full blocked
  5. Two-page Modified Block
  6. Hanging-indented
  7. Square-blocked
  8. The Simplified Letter

Lesson VI: Paragraphing and Business Letter
- A. The opening paragraph
- B. Paragraph or paragraphs containing the message
- C. The closing paragraph containing words of leave-taking

Lesson VII: Writing the Letter
- A. Classification of business letters
- B. A specimen formula

Lesson VIII: Credit and Collection Letters
- A. The three credit "C's"
- B. Letters granting credit
- C. Letters refusing credit
- D. Classification of credit risks
- E. Four collection letters

Lesson IX: Order Letters
- A. A formula for order letters
- B. Acknowledgments of routine orders
  1. Faulty orders
  2. Unavoidable delays in shipment
  3. Welcome to new customers

Lesson X: Inquiries and Requests
- A. Solicited inquiries
- B. Unsolicited inquiries
- C. Mutual-inquiry requests

Lesson XI: Claim and Adjustment Letters
- A. Formula for a claim letter
- B. Formula for granting an adjustment
- C. Formula for refusing a claim
- D. Formula for a compromise settlement offer

Course Outline (Continued)

Lesson XII: Sales Letters

- A. The relation between sales and human behavior
- B. The general principles applicable to sales letters
- C. The letter plan designed especially for sales letters
    - 1. Arouse interest
    - 2. Create desire
    - 3. Convince the prospect
    - 4. Get action

Lesson XIII: Form Letters

CONFERENCE LEADERSHIP
Supervisory Personnel
Development

The Conference Leadership material was written in 1958. The material is complete and bound in one book. The Hand Outs can be ordered separately if needed.

There are no references. A detailed course outline follows.

Introduction

- I. The Conference
  - 1. Kinds of conferences
  - 2. The training conference - definitions
    - a. What it is not
    - b. A typical sequence of events
  - 3. Conference training and vocational education
  - 4. Comparison of conference methods
  - 5. The "J" programs
    - a. Canned vs. tailored programs
  - 6. Executive development programs
  - 7. Definition of terms
  - 8. Public relation values to schools
    - a. Supervisor role in hiring
    - b. A definite useful service to industry
    - c. Entree to other programs
- II. The Conference Leader
  - A. The leader
    - 1. A social skill
    - 2. Personal values
    - 3. Duties of the leader
    - 4. Techniques
    - 5. Need for continuous study, practice and self evaluation
    - 6. Not to expert
  - B. The Conferee
    - 1. Line and staff
    - 2. Experience and its effect on the conference
    - 3. Typical characters and how to handle
    - 4. Seating
    - 5. Scheduling of conference
    - 6. One or more companies
    - 7. Size of the groups

- III. Preparing for a Conference
  - A. The Outline
    - 1. How to go about making it - forms
    - 2. Formulation question and objectives
    - 3. Notes in margin
    - 4. Plan what is to be charted
      - a. Chart headings
    - 5. Plan the visual aids

Course Outline (Continued)

III. Preparing for a Conference (Continued)
    6. Techniques in planning group participation
        a. Role playing
        b. Buzz sessions
        c. Quiz sheets
        d. Evaluate by rating
        e. Hand out
        f. Film case
    7. Your source material
        a. Current magazines
        b. Other reports
        c. Basic reading library (hand out list)
        d. Files - by block and by subject (helpful sources)
    8. Learn your outline
    9. Samples of conference outlines
  B. Aids and Devices
    1. The chart or blackboard
    2. Projector equipment and films
    3. Charts, graphs, etc.
    4. Flannel Board
    5. Balancing ring
  C. Physical Arrangements
    1. The room
        a. Free of distraction
        b. Near comfort facilities
    2. Tables
        a. Destroy classroom atmosphere
        b. Ways of arranging table
        c. Who arranges the room
    3. Name cards - in advance
        a. How to insert names
        b. Do not move around
        c. Used for enrollment purpose
    4. Projector, extension cord, etc.
    5. Charts, paper, etc.
    6. Leaders position, rostrum - affect on seating
    7. Time needed to make arrangements
    8. Plant pass

IV. Conducting a Conference
  A. First Conference - getting started
    1. Introduction - yourself by a Company or School Official - information about yourself and others
    2. Graphic demonstration (3 ring)
    3. Swapping dollars

Course Outline (Continued)

IV. Conducting a Conference (Continued)
        4. Outline responsibility - yours and theirs - cards
        5. Place cards - do not switch
        6. Hand out session titles
        7. Conference mood
    B. Keeping on the track
    C. Chart objectives and first question
    D. Pacing the conference
    E. Conference situations
    F. Key probing words
    G. To initiate, stimulate, and control discussion
    H. Draw all into discussion
    I. Start and stop on time
    J. Deal with principles not personalities
    K. Gain and hold confidence of group
    L. Remember minority groups
    M. Do not expert
    N. Presents information or cases in the third person
    O. Do not let conference become too academic
    P. Gestures and movements - redirect thinking
    Q. Humor and its use
    R. Evaluates by order of preference not voting
    S. Side tracking a subject for future consideration
    T. Avoid the feeling that all you're trying to do is develop a list
    U. Hints on overcoming "stage fright"
    V. Rate instead of voting
    W. Mother Hubbard terms
    X. Evaluation
        1. Self
        2. Rating sheets
        3. Participation charts
        4. Group reaction
        5. For the company
        6. Any repeats?
        7. Value to your school
        8. Work shop and other evaluators
        9. The conference report
    Y. Visitors
    Z. Break after one hour
    AA. Common weakness of inexperienced conference leaders
        1. Spends too much time getting definition
        2. Votes on importance of contribution
        3. Opposite or reverse charting contribution
        4. Does not reach conclusion
        5. Becomes a slave to rapid contributions
        6. Starts with an excessive group
        7. Drives too hard
        8. Looses control - fails to plan closing of session
        9. Participants freeze
        10. Thrown by Mother Hubbard

Course Outline (Continued)

V. The Conference Report
   1. What it is and why write it
   2. What information to and not to include
   3. Mechanics of writing and binding
   4. Copies to print
   5. Piece meal type of report
   6. What the bound volume should include

VI. Scope of Supervisory Personnel Development
   1. Interest makes it broad
   2. Functions of local school and State Department of Education
   3. Canned vs. tailored
   4. Methods
      a. Conference series
      b. Workshop
      c. Panels
      d. Symposiums
      e. Question and answer method
      f. Case study
      g. Brainstorming
      h. Lecture
   5. Typical content of programs
      a. Now and expected needs
      b. Skill development - heavy participation
   6. Typical prospects for supervisory personnel development programs
   7. Approaching industry
   8. Local and national organizations that are helpful
   9. "Call Staff" and its use
   10. The "Executive Development" idea

VII. The Forty-hour Workshop
   1. How material is presented
      a. Hand outs and binders
   2. Topics for practice conferences
   3. Time schedule
   4. Evaluation
   5. Practice report writing
   6. Use of outside help
   7. Displace aids and references
   8. The film "All I Need is a Conference"
   9. Demonstrate techniques
   10. State specific objectives for the workshop
   11. Use variety of techniques
   12. Surplus stock of material
   13. Prompt on first practice session

Course Outline (Continued)

Unit VII (Continued)
14. Round-robin idea
15. Selection of participants
16. Reversing the procedure
17. Participants reach a level of experting

Appendix

Slides to be used with this course are also available. There are 54 slides in a set at $1.00 per slide.

Industrial Economics was written in 1964. It is available in bound form in one book.

The reference for the Industrial Economics Course is the following:

| Title | Source |
|---|---|
| INDUSTRY AND THE AMERICAN ECONOMY (11 booklets) | National Association of Manufacturers<br>Education Department<br>2 East 48th Street<br>New York 17, New York |

A detailed outline of the Industrial Economics Course follows:

Session I - Introduction to Free Competitive Enterprise

Session II - What Makes an Economy Grow

Session III - The Role of Competition

Session IV - The Role of Marketing

Session V - Incentive and its Results

Session VI - The Role of Organization in our Economy

Session VII - Government's Role in our Economy

The Extemporaneous Talk for Industrial Supervisors was published in 1959. It is available in book form.

The references for this course are as follows.

| Title | Source |
|---|---|
| Effective Expression<br>Part D | USAF Extension Course Institute<br>Superintendent of Pub. Documents<br>Washington 25, D. C. |
| Effective Expression<br>Part E | USAF Extension Course Institute<br>Superintendent of Pub. Documents<br>Washington 25, D. C. |
| Irving J. Lee<br>How To Make The Safety Speech | National Safety Council<br>425 North Michigan Avenue<br>Chicago 11, Illinois |
| M. Joseph Dooher<br>Effective Communication on the Job | American Management Association<br>1515 Broadway - Times Square<br>New York 36, New York |
| Richard C. Borden<br>Public Speaking as Listeners Like It | Harper & Brothers Publishers<br>49 East 33rd Street<br>New York 16, New York |
| William Norwood Brignance<br>Speech Communication | Appleton-Century-Crofts, Inc.<br>35 W. 32nd Street<br>New York 1, New York |
| Rudolf Flesch<br>The Art of Plain Talk | Harper & Brothers Publishers<br>49 East 33rd Street<br>New York 16, New York |
| Edward L. Friedman<br>The Speechmaker's Complete Handbook | Harper & Brothers Publishers<br>49 East 33rd Street<br>New York 16, New York |
| Irving J. Lee<br>How to Talk With People | Harper & Brother Publishers<br>49 East 33rd Street<br>New York 16, New York |
| Effective Speaking for Supervisory Personnel | Trade & Industrial Ed. Service<br>Division of Vocational Education<br>State Department of Education<br>Columbus, Ohio |

An outline of the material follows.

Part I
    You and Speech

Part II
    Stage Fright

Part III
    Planning Your Speech

Part IV
    Delivering Your Speech

Part V
    Adding Zest To Your Speech

Appendix
    "A Speech That Fits Any Occasion"

Bibliography

Slap-ons
    Session No. 1
    Session No. 2
    Session No. 3
    Session No. 4
    Session No. 5

The Highway Economics Course was published in 1960. It is available in book form.

The references for the Highway Economics Course are the following:

| Title | Source |
|---|---|
| Bach, G. L.,<br>ECONOMICS, AN INTRODUCTION TO ANALYSIS AND POLICY, 3rd Ed. | Prentice-Hall, Inc.,<br>Englewood Cliffs, New Jersey |
| Hailstones, Thomas J.,<br>BASIC ECONOMICS | Southwestern Publishing Co.<br>221 Pacific Avenue<br>Dallas 2, Texas |
| Samuelson, Paul A.,<br>ECONOMICS, AN INTRODUCTORY ANALYSIS, 4th Ed. | McGraw-Hill Book Company<br>330 West 42nd Street<br>New York 36, New York |
| Federal Reserve Bank of St. Louis, YOUR MONEY SUPPLY | Research Department<br>Federal Reserve Bank of St. Louis<br>St. Louis, Missouri |
| Shultz, Wm., J. and Harriss, C. L.,<br>AMERICAN PUBLIC FINANCE, 6th Ed. | Prentice-Hall, Inc.,<br>Englewood Cliffs, New Jersey |
| Automotive Safety Foundation<br>LOUISIANA'S HIGHWAY PROBLEM | Automotive Safety Foundation<br>Washington D. C. |
| Biannual report of the Highway Commission of Louisiana,<br>REPORT | Louisiana Department of Highways<br>Baton Rouge, Louisiana |
| Public Affairs Research Council<br>LOUISIANA STATE AGENCIES HANDBOOK | Public Affairs Research Council of Louisiana<br>Baton Rouge, Louisiana |
| STATE OF LOUISIANA HIGHWAY FINANCE | Public Affairs Research Council of Louisiana<br>Baton Rouge, Louisiana |
| Ross, William D.,<br>FINANCING HIGHWAY IMPROVEMENTS IN LOUISIANA | Division of Research<br>College of Commerce<br>Louisiana State University<br>Baton Rouge, Louisiana |

A detailed outline of the Highway Economics Course follows:

Preface

Session I - Introducing the Economic System

- 1 - Business and People
- 2 - Money's Place in the System
- 3 - Prices and Their Function Under Capitalism
- 4 - Government
- 5 - Other Business (Capital Goods)
- 6 - Summary

Session II - The Performance of the Economy

- A - Introduction
- B - Recessions and Depressions
  - 1 - Cures for Recession
  - 2 - Inflation
  - 3 - Cures for Inflation
- Appendix A - The Special Role of Money and Banks
  - 1 - Money Supply
  - 2 - The Role of Banks
  - 3 - The Control of Banks and the Money Supply

Session III - The Role of Government

- A - Introduction
- B - Government Spending
  - 1 - The "Comparative Benefit" Principle
  - 2 - Expanding Government's Service
  - 3 - Is Government Spending Mere Waste?
- C - Taxes
  - 1 - The "Benefit" Principle
  - 2 - The "Ability-to-pay" Principle
- D - Government Debts and Borrowing
  - 1 - Why Borrow?
  - 2 - The Real Dangers and Limits of Debt

Session IV - The Highway Dollar--Source

- A - Introduction
- B - Sources of Tax Income
  - 1 - The Gasoline Tax and Its Use
  - 2 - Motor Vehicle Tax
  - 3 - Other Taxes
  - 4 - Other Tax Idea
- C - Dedication and Limitations
  - 1 - Economic Limitations
  - 2 - The Nature of Dedicated Revenues

Course Outline (Continued)

Session IV - (Continued)

- D - Other Sources of Income
  - 1 - Mineral Lands
  - 2 - General Fund Appropriations
  - 3 - Federal Grants-in-aid
  - 4 - The Interstate System
- E - Borrowing for Highways
  - 1 - The Reason for Borrowing
  - 2 - To borrow or not to borrow
- Appendix B - Bonds and the Bond Market
  - 1 - The Borrowing Process
  - 2 - Interest, the Cost of Borrowing
- F - Summary
  - 1 - A Recent History
  - 2 - The Long Range Highway Program
  - 3 - Highway and the Economy

Session V - The Highway Dollar, Expenditures

- A - Introduction
- B - Construction
  - 1 - Paying for Construction
  - 2 - Contracting and Construction Work
- C - Maintenance
- D - Debt
  - 1 - Who Pays for the Debt
- E - Other Costs and Expenditure
  - 1 - State Aid to Parishes and Cities
  - 2 - Employees and Spending
- F - Collecting from Highways

Table 1 - Detail of Resources and Expenditures, Highway Department

Table 2 - Encumbered Funds, by Purpose

Table 3 - Estimates of Highway User Taxes Dedicated To Highway Department (In Thousands)

Table 4 - State Aid to Parishes

Industrial Housekeeping was written in 1962. It is available in bound form in one book.

A detailed outline of Industrial Housekeeping follows:

Session I - Indoctrination and Overview of Program
Definitions - Policies - Practices - Results

Session II - Housekeeping and You

Session III - Housekeeping and The Company

Session IV - Fire Protection and Good Housekeeping

Session V - What Can We (The Company and The Employee) Do To Improve and Maintain a Good Housekeeping Program?

# INDUSTRIAL RELATIONS FOR SUPERVISORY PERSONNEL

Industrial Relations for Supervisory Personnel was written in 1965 and is available in bound form in one book. It is composed of eight sessions.

A detailed outline of Industrial Relations for Supervisory Personnel follows:

The First Session - History and Principles of Industrial Relations

The Second Session - Personnel Management

The Third Session - Employee Training

The Fourth Session - Joint Relations and Collective Bargaining

The Fifth Session - Union Security, Management Rights, and Arbitration

The Sixth Session - The Labor Union in the Plant

The Seventh Session - Wage and Salary Administration

The Eighth Session - Seniority, Job Evaluation, and Merit Rating

Interviewing for Supervisory Personnel was written in 1963. It is available in bound form in one book.

A detailed outline of Interviewing For Supervisory Personnel follows:

The First Session - Interviewing Responsibilities of Supervisors

The Second Session - Counseling Interview

The Third Session - The Employment Interview (Background and Planning)

The Fourth Session - The Employment Interview (Conducting and Evaluating)

The Fifth Session - The Performance Interview

The Sixth Session - The Corrective Interview

The Seventh Session - Other Interviews (The Exit Interview, The Stress Interview, The Group Interview, The Board Interview, and the Grievance Interview)

The Eighth Session - Practice Interviewing

INTRODUCTION TO MANAGEMENT
FOR INDUSTRIAL SUPERVISORS
Supervisory Personnel
Development

The Introduction to Management for Industrial Supervisors Course was written in 1964 and is available in bound books.

A detailed course outline follows.

| | |
|---|---|
| Session I | History of Management |
| Session II | Organizational Structure |
| Session III | Major Responsibilities of Management |
| Session IV | Organized Labor |
| Session V | Leadership |

Bibliography

Handout Material

| | |
|---|---|
| Handout 1 | Course Contents |
| Handout 2 | Objectives of Management |
| Handout 3 | Principles of Scientific Management |
| Handout 4 | Summarization of the Hawthorne Experiment |
| Handout 5 | Characteristics of the Corporation |
| Handout 6 | Corporate Form of Organization |
| Handout 7 | Authority, Responsibility, and Delegation |
| Handout 8 | Line-Type Organization |
| Handout 9 | Line and Staff Organizational Structure |
| Handout 10 | Planning--A Function of Management |
| Handout 11 | Organizing--A Function of Management |
| Handout 12 | Delegating--A Function of Management |
| Handout 13 | Controlling--A Function of Management |
| Handout 14 | Co-ordinating--A Function of Management |
| Handout 15 | Structural Organization of the American Federation of Labor and Congress of Industrial Organization |

Course Outline (Continued)

| | |
|---|---|
| Handout 16 | The Structure of the A.F.L.-C.I.O. in Louisiana |
| Handout 17 | The Supervisor--Driver or Leader? |
| Handout 18 | Qualifications for Leadership |
| Handout 19 | Leadership Self-Appraisal Test |
| Handout 20 | Principles of Effective Human Relations |

Listening was written in 1962. It is available in bound form in one book. Slides which are used with the course are available.

A detailed outline of Listening follows:

Introduction

Chapter I, Section I, Why Listen - Outline

Chapter I, Section I, Why Listen

Section Two, Introduction

Chapter I, Section II, Exercise

Chapter II, Section I, What Happens - Outline

Chapter II, Section I, What Happens

Chapter II, Section II, Exercise

Chapter III, Section I, What's the Matter and What to do - Outline

Chapter III, Section II, Exercise

Chapter IV, Section I, What Strikes the Ear - Outline

Chapter IV, Section I, What Strikes the Ear

Chapter IV, Section II, Exercise

Chapter V, Section I, Semantics - Outline

Chapter V, Section I, What Do You Mean

Chapter V, Section II, Exercise

Chapter VI, Section I, No H-Ear - Outline

Chapter VI, Section I, No H-Ear

Chapter VI, Section II, Exercise

Films

Books

Course Outline (Continued)

Published Articles

Sources - Recorded Materials

Hamlet Text

Slides to be used with this course are also available. There are 46 slides in the set at $1.00 per slide.

REPORT WRITING
Supervisory Personnel
Development

Report Writing was written in 1963. It is available in bound form in one book.

A detailed outline of Report Writing follows:

The First Session - The Importance of Report Writing

The Second Session - The Characteristics of a Good Report

The Third Session - Organization and Form in Report Writing

The Fourth Session - The Style of the Report

The Fifth Session - How to Outline a Report

The Sixth Session - Writing the Report

The Seventh Session - The Use of Illustrations and Tables

The Eighth Session - Problems in Preparing and Writing Reports

The Ninth Session - The Oral Presentation of a Report

The Tenth Session - Security Requirements

Understanding Human Nature was written in 1959. It is available in book form. There are eight sessions, each session is bound separately. The ninth book will be the Handouts, Self-tests and Student Summary.

The references for the Understanding Human Nature Course are, the following:

| Title | Source |
|---|---|
| Anastasi, Ann<br>DIFFERENTIAL PSYCHOLOGY | The Macmillan Company<br>60 Fifth Avenue<br>New York 11, New York |
| Cameron, Norman,<br>THE PSYCHOLOGY OF BEHAVIOR DISORDERS | Houghton Mifflin Company<br>432 Fourth Avenue<br>New York 16, New York |
| READER'S DIGEST,<br>April, 1947 | Reader's Digest Association, Inc.<br>Pleasantville, New York |
| Harper, Robert A.,<br>PSYCHOANALYSIS AND PSYCHOTHERAPY | Prentice-Hall, Inc.<br>Englewood Cliffs, N. J. |
| Hepner, Harry Walker<br>PSYCHOLOGY APPLIED TO LIFE AND WORK | Prentice-Hall, Inc.<br>Englewood Cliffs, N. J. |
| Leavitt, Harold L.,<br>MANAGERIAL PSYCHOLOGY | University of Chicago Press<br>5750 Ellis Avenue<br>Chicago 37, Illinois |
| Maier, Norman R.F.,<br>PSYCHOLOGY IN INDUSTRY<br>Second Edition | Houghton Mifflin Company<br>432 Fourth Avenue<br>New York 16, New York |
| Marlow, A. H.,<br>MOTIVATION AND PERSONALITY | Harper and Brothers<br>49 East 33rd Street<br>New York 16, New York |
| Mullahy, Patric , Oedipus,<br>MYTH AND COMPLEX | Hermitage House, Inc.<br>8 West 13th Street<br>New York 11, New York |
| Smith, Karl U. and William M. Smith<br>THE BEHAVIOR OF MAN | Henry Holt and Co., Inc.<br>383 Madison Avenue<br>New York 17, New York |
| Tiffin, Joseph and Earnest J. McCormick,<br>INDUSTRIAL PSYCHOLOGY | Prentice-Hall, Inc.<br>Englewood Cliffs, N. J. |

A detailed outline of Understanding Human Nature follows:

First Session - People are All alike in Different Ways

- I. People are all the Same
  - A. Popular Generalizations
  - B. Useful Generalizations
    - 1. All Behavior Is Caused
    - 2. All Behavior Is Motivated
    - 3. All Behavior Is Goal-Seeking
    - 4. Self-Actualizing Urge
    - 5. Same Basic Needs
    - 6. Products of Heredity and Environment
- II. People Are All Different
  - 1. Different Bases of Behavior
  - 2. Different Need-Behavior

Second Session - Human Needs - Origin of Behavior

- I. Blueprint and Behavior
- II. Levels of Needs

Third Session - What Makes People The Way They Are?

- I. What Determines Personality?
  - 1. Receptors
  - 2. Connectors
  - 3. Effectors
  - 4. Endocrine Glands

  - 1. Sources of Satisfactions
  - 2. Care in Infancy
  - 3. Examples Set by Parents
  - 4. Treatment by Intimates
  - 5. Demands vs Capacities
  - 6. Success vs Failure
- II. Psychoanalytic Interpretations

Fourth Session - What Makes People the Way They Are (Continued

- I. Frustration
- II. Significant Traits
- III. Habits--Curse or Blessings?

## Fifth Session - Nature and Uses of Motivation

I. The Nature of Motives.

II. Universal Motives

III. Applying Motivation

## Sixth Session - Attitudes and Morale

I. Checking Attitudes

II. How Attitudes Work
  1. Imitation
  2. Emotional Experiences
  3. Informative Experiences
  4. Self-Cultivation

III. Job Aspects Important to Workers

IV. Team Spirit on the Job
  1. Supervisory Relationships
  2. Decision Making
  3. Clean Communications

## Seventh Session - How Working Conditions Affect Human Behavior

I. The Human Nature of Accidents
  1. Vision
  2. Age or Length of Service
  3. Emotions
  4. Mental Ability
  5. Impulsiveness
  6. Popularity

II. Working Conditions and Efficiency
  1. Visual Conditions
  2. Noise Conditions
  3. Temperature Conditions
  4. Work Hours
  5. Rest Pauses
  6. Boredom

III. Human Engineering
  1. Information-Receiving
  2. Decision-Making
  3. Action-Taking

## Eighth Session - How Co-Workers Affect Behavior of Each Other

I. Person-to-Person Behavior

II. Structure and Operation of a Group

III. Communication Systems in Groups

Selected Bibliography

Handouts #1, 2, 3, 4.

Slides to be used with this course are also available.
There are 76 slides in a set at $1.00 per slide.

Work Simplification was written in 1962. It is available in bound form in one book.

A detailed outline of Work Simplification follows:

| | |
|---|---|
| The First Session, Part I | Introduction to the Program |
| The First Session, Part II | Discussion of the Work Distribution Chart |
| The Second Session | Group Laboratory Meeting on The Work Distribution Chart |
| The Third Session | Discussion of the Process Chart |
| The Fourth Session | Group Laboratory Meeting on the Process Chart |
| The Fifth Session | Discussion of the Work Count |
| The Sixth Session | Individual Laboratory on the Work Count |
| The Seventh Session | Final Group Laboratory "Work Simplification Roundup" |

Slides to be used with this course are also available. There are 72 slides in a set at $1.00 per slide.

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